

COMMUNICATION BETWEEN PUBLIC SCHOOL LEADERS TO SUPPORT  
SYSTEMIC INNOVATION OF CLASSROOM PRACTICE

by  
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## **Abstract**

Although the instability and rapid technological advances associated with the knowledge economy of the 21st century call for changes in the institution of education (Meyer, 2006), the American K-12 public school system largely remains fixed in an industrial era bureaucracy (Soulé & Warrick, 2015; Weeres & Kerchner, 1995). Analysis of the literature as well as a needs assessment conducted in four, small, suburban districts in the Northeastern region of the U.S. determined that district administrators and school leaders lack a shared language to clearly communicate a vision for instructional innovation to prepare students with future skills such that the ideas diffuse throughout the social networks of the district's ecosystem (Rogers, 2004a). Thus, the researcher used Senge's (1990; 2006) theoretical framework of Organizational Learning Communities to design an intervention to improve the quantity and quality of communication between central office and building leaders, develop common language to describe innovation of classroom practice to prepare students with future skills for the knowledge economy, and increase districts' capacity for organizational learning. Frequently used to assess school innovations, the researcher employed a multi-site, explanatory case study as a variant on an embedded mixed-methods design (Martinson & O'Brien, 2010) and implemented it in three of the districts who participated in the needs assessment. The mostly qualitative process evaluation embedded within the quantitative outcome evaluation allowed the researcher to triangulate findings and build rich descriptions of the intervention in context (Creswell & Plano Clark, 2011).

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## **Dedication**

This dissertation is dedicated to the following people:

To my husband, Michael T. Boardman, who supported me through this entire process, tolerated my occasional grumpiness, and encouraged me to take advantage of every opportunity that has presented itself over the past three years.

To my cousin, Renee Cohen, who has filled the role of grandmother over the last few years and always made me feel as though I was doing the right thing.

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## **Executive Summary**

The American public education system currently finds itself caught between its past and its present. The industrial-era values of standardization, efficiency, and scientific management that formed the organizational culture on which most schools and educators base their identities (Tyack & Tobin, 1994; Tyack & Cuban, 1995) has become obsolete. Today's knowledge-based society questions whether existing educational institutions possess the capacity to prepare students for a future characterized by technology-infusion, globalization, and rapid-change (World Economic Forum, 2015). Although the instability and rapid technological advances associated with the knowledge economy of the 21st century call for changes in the institution of education (Meyer, 2006), the American K-12 public school system largely remains fixed in an industrial era bureaucracy (Soulé & Warrick, 2015; Weeres & Kerchner, 1995).

If schools and districts intend to prepare students for the intellectual, technological, and interpersonal demands of the knowledge economy (Levy & Murnane, 2013), then teachers need the opportunity to work within a system that will support and encourage instructional innovation (Martinez, McGrath, & Foster, 2016). Today's schools need to adopt a new set of pedagogies — one that takes advantage of technology, encourages mastery of content, and involves both the creation as well as the consumption of new knowledge so that it can be applied to real-world contexts (Fullan & Langworthy, 2014). Unfortunately, a problem of practice exists: district administrators and building leaders in American public schools lack a shared language to clearly communicate a vision for innovation of classroom practice to prepare students with future skills such that the ideas diffuse throughout the social networks of the district's ecosystem (Rogers,

2004). This communication failure prohibits school and district leaders from bringing the education system into alignment to meet the disparate demands of the knowledge economy (Honig & Rainey, 2015).

### **Understanding and Measuring the Problem of Practice**

Previous reform efforts have been proposed within the confines of the institution of the American educational system, but the knowledge economy challenges the very structures of the institution itself (Chubb & Moe, 1990). Now in the midst of the 21<sup>st</sup> century, the education system requires not only pockets of excellence within individual classrooms and buildings, but the implementation of innovative instructional practices across entire districts. Given the complexity and variation that characterizes American public schools, this poses a challenge (Bryk, Gomez, Grunow, & LeMahieu, 2015).

### **The Challenge of Interdependent Systems**

Many educational endeavors do not take contextual factors into account and assume a linear relationship between a policy or program and the desired result (Domitrovich et al., 2008). Conversely, a social-ecological framework examines the influence of multiple factors on a given area of focus (Domitrovich et al., 2008). Because schools and districts exist as complex ecologies, they require more than a simple, linear, cause-and-effect model to understand the interactions that may influence change (Johnson, 2008). Ecological Systems Theory (EST) (Bronfenbrenner, 1979) provides such a framework as it accounts for the interdependent systems of context, process, and individuals as well as the general complexity associated with education (Johnson, 2008). The researcher first used EST (Bronfenbrenner, 1979) as the lens through which to examine the literature related to the problem of practice beginning with the chronosystem

– the socio historical systems on which American public school districts formed their identity.

The historical drivers as well as the culture of standardization and efficiency that influenced the advent of public education during the industrial era (Tyack & Cuban, 1995) continue to impact the cultures and underlying ideologies (Bronfenbrenner, 1979) that drive the interactions of teachers, administrators, and students today. Unlike other professions, teachers and administrators became entrenched in the system and culture of school as students (Tyack & Cuban, 1995), forming mental models as they observed classroom practices (Bandura, 1986) before ever entering the profession. Over time, the organizational culture of schools has evolved as a result of the “systemic memory inherent in the system” (Johnson, 2008), p. 6).

However, today’s world does not resemble that of previous generations, and the institution of public education in the U.S. never intended to prepare students for the intellectual and technological demands of the knowledge economy (Levy & Murnane, 2013). Moreover, external pressures such as state and federal mandates (Fulmer & Turner, 2014) as well as the introduction of new technologies (Zhao & Frank, 2003) further impact the ecology and culture of districts and schools. As a result of the forces created by these systems, school and district leaders lack sufficient language and social networks to communicate an understanding of instructional innovation to prepare students with future skills. Therefore, the problem of practice exists in part because of the influences that these various systems have on the communication patterns between central office and building leaders.

## **Examining the Problem in Context**

To examine this problem of practice in context, the author conducted an explanatory, mixed-methods study (Creswell & Plano Clark, 2011) in four small, suburban districts in the Northeast region of the U.S. To better elucidate the underlying causes and factors, the study incorporated both quantitative and qualitative measures to gain a deeper understanding of perceptions from both central office and building leaders. Though the needs assessment hypothesized that bureaucratic organizational structures could be an underlying factor, analysis of the data revealed a different challenge.

Quantitative data collected via the Professional Learning Community Assessment - Revised (PLCA-R) (Olivier, Antoine, & Cormier, 2009) and ENTRELEAD (Renko, Tarabishy, Carsrud, & Brännback, 2013) scales indicated that central office and building leaders perceived both the presence of a professional learning community as well as entrepreneurial, innovative leadership within their districts. However, responses varied considerably to survey questions from the *21st Century Skills/Deeper Learning Element* of the *Curriculum, Instruction, and Assessment* sub scale of the Future Ready Dashboard (Alliance for Education, 2015a). Additionally, qualitative analysis of open-response questions asking participants to state what they perceived to be a vision for innovation of classroom practice uncovered discrepancies within the districts. Beyond little consistency in language between participants, most responses did not align with their district's published technology or strategic plans. After examining both the quantitative and qualitative data, the researcher ascribed the problem of practice to a lack of communication and common language between the leaders in the districts rather than

hierarchical, bureaucratic structures. This presented a challenging opportunity for intervention.

### **An Intervention Study to Improve Communication and Organizational Learning**

After considering various professional development models, digital tools, as well as structures to support community building, the researcher designed an intervention program around a set of digital resources intended to promote communication, the development of common language, and increased capacity for organizational learning. The idea to create tools and protocols for communication as well as extended opportunities for professional learning emerged from analysis of two international studies (Shear, Patel, & Trinidad, 2014; SRI, 2009) and a multi-year case study that observed how broader ideas about 21<sup>st</sup> century learning and global education translated into classroom practice across an entire district (Choo, Sawch, Villanueva, & Chan, 2017). Incorporating an online platform to provide just-in-time access to professional development (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2008; Rienties, Brouwer, & Lygo-Baker, 2013) and encourage leaders to use technology for problem solving (Koehler & Mishra, 2005) evolved from the professional development literature. The decision to design digital tools that would provide protocols and structures for communication as well as strengthen community connections emerged from the needs assessment data. Finally, Organizational Learning Communities (OLCs) (Senge, 1990; 2006) became the theoretical framework guiding the design of the resources.

### **Theoretical Framework for the Intervention**

Organizational learning (Senge, 1990; 2006) encourages three interrelated activities: theory-building, practice, and capacity-building (Senge & Kim, 2013). Thus,



the intervention intended for the following to occur. Theory-building constituted the creation of common language to support innovation of classroom practice to prepare students for the knowledge economy. Practice would occur as participants engaged in joint work (Honig, 2012; Honig & Rainey, 2014), boundary-spanning, and brokering (Honig, 2008; Swinnerton, 2007) while interacting with the digital resources. Capacity-building activities such as the strengthening of social networks through increased communication (Daly & Finnigan, 2010; Frank, Zhao, & Borman, 2004; Umekubo, Chrispeels, & Daly, 2015) connected the theory of shared language to the practice of the sociocultural activities to create new capacities for organizational learning (Senge & Kim, 2013).

### **Research Design**

Oftentimes in educational research, intervention studies do not take the variability of context into account (LeMahieu, Edwards, & Gomez, 2015). Therefore, the researcher conducted a multi-site, explanatory case study as a variant on a mixed-methods, embedded design (Creswell & Plano Clark, 2011) in three of the districts who had participated in the needs assessment. Frequently employed to evaluate school innovations, multi-site explanatory case studies present rich descriptions and deep explanations (Martinson & O'Brien, 2010). The study intended to triangulate findings across the districts to determine whether participating in the intervention improved communication, supported the development of shared language, and increased each district's capacity for organizational learning.

The researcher selected the districts using a theoretical sampling technique (Teddlie & Yu, 2007) to study the underlying causes and factors preventing the systemic

spread of innovation. Each district had previously established committees consisting of central office and building leaders to support innovation of classroom practice to prepare students for the knowledge economy. However, initial conversations with the Superintendents and Assistant Superintendents as well as the needs assessment confirmed that a common language to describe innovation of classroom practice to prepare students for the knowledge economy did not exist. Thus, the intervention intended to provide district and building leaders with training, the digital resources, as well as both face-to-face and online support throughout the Fall of 2017.

To measure the proximal and medial outcomes of increased communication, the development of shared language, and improved capacity for organizational learning, the researcher asked the following outcome questions:

RQ1: To what degree did using the digital resources affect the organizational learning capacity of the districts?

RQ2: How did the language used by participants to describe innovative classroom practice to prepare students for the knowledge economy change as a result of using the resources?

RQ3: How did engaging in the sociocultural activities with the resources affect communication between the participants within their districts?

The outcome evaluation included quantitative data from the Organizational Learning Survey (Goh & Richards, 1997), social network analysis using the School Staff Social Network Questionnaire (Pitts & Spillane, 2009), and qualitative analysis of open-ended questions. An online survey administered before the start of the intervention, and at the conclusion, collected the quantitative and qualitative data. As described by the

procedures for an embedded design, a secondary process evaluation supported and corroborated the analysis of the outcome data (Creswell & Plano Clark, 2011). By embedding this secondary study within the primary outcome evaluation (Creswell & Plano Clark, 2011), the researcher could draw stronger conclusions based on the fidelity of implementation (O'Donnell, 2008). The process evaluation focused on measuring indicators for frequency, dose, adherence, and responsiveness (Dusenbury, Brannigan, & Falco, 2003) to inform the outcome evaluation.

### **Findings**

The three districts who participated in the intervention had similar demographics, and yet they possessed distinctly different characteristics that impacted implementation. To accommodate the districts' schedules, union requirements, and internal power dynamics, the researcher modified the initial training session, schedule of face-to-face meetings, and even the design of the digital resources to encourage participation. Though these changes affected the intervention fidelity, adapting the program to the realities of the context in each district afforded an opportunity to account for variability (LeMahieu et al., 2015). The rich descriptions from the multiple case studies then allowed the researcher to examine cause and effect relationships within each district (Martinson & O'Brien, 2010).

According to Dusenbury et al. (2003), fidelity of implementation includes discussion of frequency or dose, adherence to the original design, and participant responsiveness. Across the three districts, fidelity of implementation could be described as low to moderate on all three of these indicators. Additionally, the 40-70% attrition

across the three districts threatened the validity of the analysis of the post-test data (Shadish, Cook, & Campbell, 2002).

To address the first research question, the Organizational Learning Survey (OLS) (Goh & Richards, 1997) measured changes in organizational learning capacity through pre and post-tests. The quantitative survey data did not reveal any significant changes across the districts as measured by the nonparametric Wilcoxon Signed Rank Test. However, the researcher discovered that the mean scores from all three districts surpassed those projected by the study validating the instrument (Goh & Richards, 1997). These findings on the OLS mirrored the relatively high scores detected by the Professional Learning Communities Assessment – Revised (PLCA-R) scale (Olivier et al., 2009) during the needs assessment. When considered together, they indicated that the districts perceived the presence of learning communities even though other measures contradicted this perception.

Next, the researcher looked for changes in language to describe innovation of classroom practice. Though qualitative statements asking participants to define innovation were collected via the pre and post-test surveys, the researcher chose to instead examine the qualitative data collected during the process evaluation. Much like with the analysis of statements from the needs assessment, the researcher found that participants often used symbolic language that created an appearance of innovation (Bolman & Deal, 2008) but without defining the desired change or describing how it might be implemented. Qualitative analysis of data collected during face-to-face meetings as well as through the digital resources also revealed that few participants engaged in conversations about classroom practice.

Finally, to address whether engaging in the sociocultural activities with the digital resources affected communication between the participants within their districts, the researcher examined both the sociograms generated from the social network analysis and the qualitative data collected during the process evaluation. The sociograms generated from the pre-test social network data illustrated that each district possessed distinctly different communication structures. Whereas one boasted lots of connections with little perceived influence as indicated by Likert-scale responses to the School Staff Social Network Questionnaire (Pitts & Spillane, 2009), another indicated a tightly centralized structure, and the third revealed that each division within the district (elementary, middle, and high school) existed as a separate community. Given the participant attrition, the post-test data did not show a significant change in quantity or quality of communication. However, qualitative observations revealed that some participants used the components of the resources — either in a different format or as a verbal protocol — to engage in the sociocultural activities as intended.

### **Conclusions**

Diffusion of any new policy, reform, or idea through the ecosystem of an organization requires strong social ties to facilitate communication (McLendon, Cohen-Vogel, & Wachen, 2015; Rogers, 2004). The digital resources intended to provide districts with tools to strengthen existing communication networks. Unfortunately, institutionalized power dynamics resulting from a tradition of hierarchical bureaucracy (Meyer, 2006; Weeres & Kerchner, 1995) often discouraged or prevented their use. Communication, collaboration, and transparency threaten the entrenched hierarchies within districts and their associated structural power dynamics (Bolman & Deal, 2008).

Much of the participant resistance observed during this intervention can be attributed to individual actors attempting to maintain power based on existing structures.

If schools and districts hope to systemically innovate instructional practice to prepare students for the knowledge economy, then leaders need to model the traits of critical thinking, complex problem-solving, and creativity that they hope to see in their students (Gialamas, Pelonis, & Medeiros, 2014). Beyond the use of symbolic language and “organizational theater” (Bolman & Deal, 2008, p. 299) that gives the appearance of action, leaders need to create a school culture that promotes change and requires communication to create a new vision of learning (Gialamas et al., 2014). Though the logic of the intervention did not produce the outcomes as intended, the theory of treatment built on the framework of organizational learning (Senge, 1990;2006) could support future designs that include more in-person instruction and leadership coaching.

## Chapter 1

### Understanding the Problem of Practice

The American public education system currently finds itself at a crossroads. In one direction lies the history that formed and influenced its organizational culture and structures — what Tyack and Cuban (1995) refer to as “the grammar of school” (p. 9). In the other, lies a “knowledge society [that] has called into question the capacity of existing institutions to provide both excellence and equity” (Weeres & Kerchner, 1995, p. 136) to prepare students for the future. Although the instability and rapid technological advances associated with the knowledge economy of the 21st century call for changes in the institution of education (Meyer, 2006), the American K-12 public school system largely remains fixed in an industrial era model (Soulé & Warrick, 2015; Weeres & Kerchner, 1995).

If schools and districts intend to prepare students for the intellectual, technological, and interpersonal demands of the knowledge economy (Levy & Murnane, 2013), then teachers need the opportunity to work within a system that will support and encourage instructional innovation (Martinez, McGrath, & Foster, 2016). Unfortunately, a problem of practice exists: district administrators and school leaders lack a shared language to clearly communicate a vision for instructional innovation to prepare students with future skills such that the ideas diffuse throughout the social networks of the district's ecosystem (Rogers, 2004a). This communication failure prohibits school and district leaders from bringing the education system into alignment to meet the disparate demands of the knowledge economy (Honig & Rainey, 2015). Given the multiple meanings associated with the concept of *communication*, later chapters explicitly define it

as how information flows through social networks (Daly, Finnigan, Moolenar, & Che, 2014) as well as the development of common language (Mourshed, Chijioke, & Barber, 2010) to describe innovation of classroom practice to prepare students for the knowledge economy.

This first chapter examines the problem of practice through a review of the literature. First, it describes the emergence of educational challenges associated with the knowledge economy. Then, it presents an argument for using Bronfenbrenner's (1979) Ecological Systems Theory (EST) as a theoretical framework through which to examine the systems that define the institution of American public education. The remainder of the chapter describes the interdependent systems that influence American public school districts and explains how their interactions contribute to the problem of practice.

### **The Challenges of the Knowledge Economy**

Computerization first emerged in 1960, fundamentally changing the task composition of the labor market (Autor, Levy, & Murnane, 2003). Though the public education system had been designed to prepare workers for an industrial economy that valued efficiency and standardization (Tyack & Tobin, 1994), the knowledge economy demands more educated workers who can engage in creative problem solving, complex communication, and the completion of non-routine tasks (Autor et al., 2003). However, since the introduction of technology, the American public school system has largely failed to keep pace with modern economic demands, resulting in a documented skills gap (Gordon, 2014; Soulé & Warrick, 2015). In 2013, the Bureau of Labor Statistics (BLS) attributed the nationally decreasing labor-participation rate to a growing skills-job mismatch and argued that the demand for talent exceeds the available supply of workers



(Gordon, 2014). The BLS ascribed this problem to an “underlying structural failure in the U.S. education-to-employment system” (Gordon, 2014, p. 1) as employers value workers with the ability to engage in critical thinking, leadership, and knowledge management — skills not being honed and assessed at the school (Soulé & Warrick, 2015) and university level (Collet, Hine, & Plessis, 2015).

In 1971, author and futurist Alvin Toffler predicted this educational predicament. He quoted psychologist Dr. Herman Gerjouy in his book *Future Shock* as saying,

The new education must teach the individual how to classify and reclassify information, how to evaluate its veracity, how to change categories when necessary, how to move from the concrete to the abstract and back, how to look at problems from a new direction – how to teach himself. Tomorrow’s illiterate will not be the man who can’t read; he will be the man who has not learned how to learn (Toffler, 1971, p. 414).

Over four decades later, the Yidan Prize Foundation commissioned the Economist Intelligence Unit (EIU) — an international, non-partisan research group — to produce the *Worldwide Educating for the Future Index* as a means to understand the tenets of effective systems designed to prepare students for success in the future (Walton, 2017). Unlike previous comparative studies of international education systems that examined outputs such as student assessments, this report ranked 35 countries using weighted scores on 16 indicators that aligned to three categories of inputs: policy, teachers, and openness of society. Two critical findings, corroborated by a panel of 17 global experts, emerged from the analysis. First, the policy environment must not only include implementation plans for programs that encourage real-world problem solving; active

engagement in science, technology, engineering, and math (STEM); the development of global citizenship; and the process of learning how to learn; but also assessment frameworks that value the acquisition of deeper learning and 21<sup>st</sup> century skills. Second, excellent systems possess high levels of human capital as indicated by the professionalization of the sector. Rather than exist within the control mechanisms of hierarchical bureaucracies, educators in high-performing systems operate as members of a professional community (Walton, 2017). As will be discussed, these findings conflict with the established practices of schools and districts (Soulé & Warrick, 2015; Weeres & Kerchner, 1995).

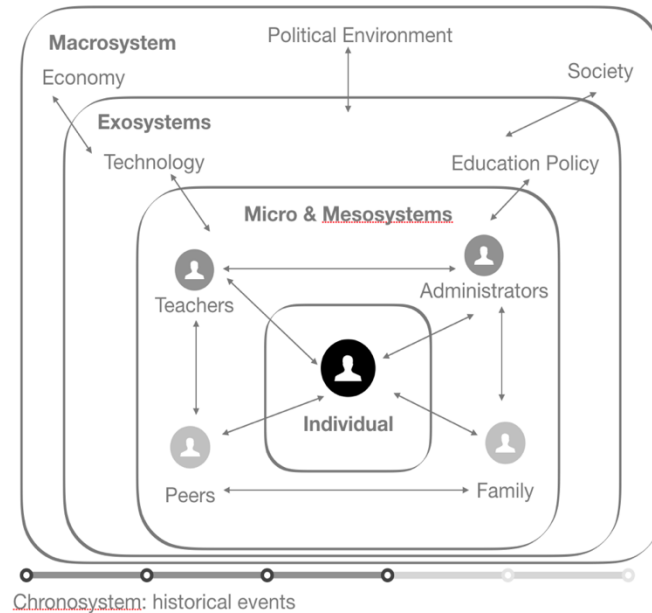
Previous reform efforts were usually proposed within the confines of the institution of the American educational system, but the knowledge economy challenges the very structures of the institution itself (Chubb & Moe, 1990). Now, in the midst of the 21<sup>st</sup> century, bridging the current education-to-employment gap (Gordon, 2014) requires not only pockets of excellence within individual classrooms and buildings, but the implementation of innovative instructional practices across the entire system. This poses a challenge given the complexity and variation that characterizes American public schools (Bryk, Gomez, Grunow, & LeMahieu, 2015). As such, Bronfenbrenner's (1979) Ecological Systems Theory (EST) serves as an appropriate theoretical framework to understand the influence of multiple systems on the problem of practice. According to Lochmiller and Lester (2017), a theoretical framework provides the foundation for a study and informs the interpretation of the research. The next section presents an argument for using EST (Bronfenbrenner, 1979) as a lens through which to view the literature related to the problem of practice.

### **Theoretical Framework: Ecological Systems Thinking**

Many educational endeavors do not take contextual factors into account and assume a linear relationship between a policy or program and the desired result (Domitrovich et al., 2008). Conversely, a social-ecological framework examines the influence of multiple factors on a given area of focus (Domitrovich et al., 2008). Because schools and districts exist as complex ecologies, they require more than a simple, linear, cause-and-effect model to understand the interactions that may influence change (Johnson, 2008). Ecological Systems Theory (EST) (Bronfenbrenner, 1979) provides such a framework in that it accounts for the interdependent systems of context, process, and individuals as well as the general complexity associated with education (Johnson, 2008).

In his seminal work, Bronfenbrenner (1979) presents the ecological environment as a set of “nested structures” (p.3) containing systems that impact the development of young children (see Figure 1). At the outermost level, the chronosystem defines the socio-historical context that influences the life of a child. For example, events such as divorce or the birth of a sibling could affect the relationships and interactions that a child experiences within his or her environment. When applied to the institution of education, the chronosystem describes the historical events that formed the organizational culture and structures on which the American public school system bases its identity. Macrosystems — which include the societal, political, cultural, and economic forces that affect the social interactions between individuals within an ecosystem (Neal & Neal, 2013) — have also shaped American public education since its inception. Whereas the macrosystem defines the broader context in which people and organizations exist,

exosystems then delineate the elements of the setting that affect the individuals within the ecology (Bronfenbrenner, 1979).



*Figure 1.* Nested systems in education. Illustration of the interactions between the nested systems in Bronfenbrenner's (1979) Ecological Systems Theory as applied to education.

Finally, at the most intimate level, the micro and mesosystems define the pattern of activities experienced by specific individuals within a given environment (Bronfenbrenner, 1979). In education, this could include the interactions between a teacher-leader and his or her colleagues; a principal and his or her teachers; or a district-level administrator with other central office leaders. Districts, schools, and individuals then operate in response to the interactions that occur amongst the layers of the nested systems (Johnson, 2008). The examples below illustrate how researchers have implemented this framework to better understand the relationships and interactions between individuals and broader systems in education.

## **Examples of Ecological Systems Theory (EST) in Practice**

By taking an ecological systems approach, the Foundations for Young Adult Success developmental framework accounts for the impact of multiple settings on how children acquire key competencies and skills for the future (Nagaoka, Farrington, Ehrlich, & Heath, 2015). The researchers recognized that students develop in response to their experiences and interactions which occur across a variety of contexts. Additionally, they acknowledged how larger societal systems affect available opportunities and environments. Given their understanding of the impact of the ecology on a young person's development, the researchers intentionally designed a framework that accounted for the pressures of external macro and exosystems while focusing on the interactions that could occur within existing institutional structures. As a result, they created a program that fostered deeper connections between the school and community organizations (e.g micro and mesosystems) associated with the participating individuals to nurture their development (Nagaoka et al., 2015).

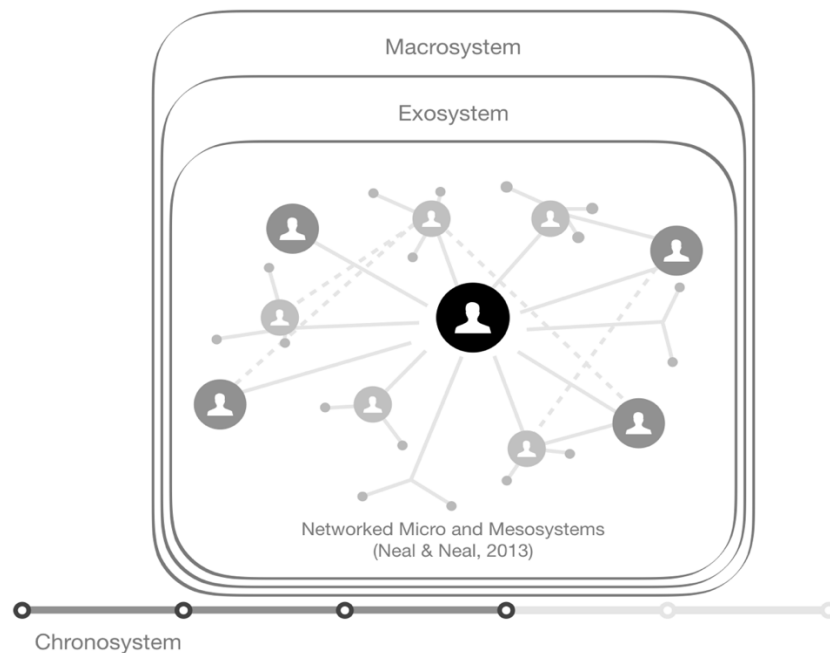
Where Nagaoka et al. (2015) took a socio-ecological approach to examine the impact of nested structures on the interactions between the micro and mesosystems effecting youth development, Malinowski and Minkler (2015) employed a similar framework to analyze the role of unions in public health by focusing on historical and contemporary effects. The authors chose Bronfenbrenner's (1979) model to better examine the interrelationships between policy, social institutions, individual interactions, and the interplay that evolved over time. A socio-ecological model looks "beyond the individual to focus on the broader sociostructural conditions and the full range of factors

affecting worker health and well-being across levels of analysis” (Malinowski & Minkler, 2015, p. 262).

Both Malinowski and Minkler (2015) as well as Nagaoka et al. (2015) applied Bronfenbrenner’s (1979) EST to examine the influence of nested systems on individuals’ interactions. They recognized that a linear approach of inputs and outputs would be insufficient to understand the complexity of the context (Johnson, 2008). To address the organizational culture and structure of districts as well as the interactions that then occur within the American K-12 public school system requires understanding the dynamics of the system itself. Therefore, Ecological Systems Theory (Bronfenbrenner, 1979) serves as the theoretical framework through which to examine the interactions that influence communication about innovation of classroom practice both within schools and across districts.

### **Using Ecological Systems Theory to Understand the Problem of Practice**

Though Bronfenbrenner (1979) illustrated EST as a set of “nested structures” (p.3), Neal and Neal (2013) assert that ecological systems should be visualized as networked to better illustrate the relationships, connections, and interactions between the multiple nodes in the ecology. As illustrated by Figure 2, within the context of this problem of practice, networked micro and mesosystems exist within multiple, nested systems. This ecological systems approach provides an appropriate framework through which to examine the complexities associated with the system of education (Johnson, 2008).



*Figure 2.* Networked systems inside of nested structures. Illustration of the concept of networked micro and mesosystems (Neal & Neal, 2013) within nested outer systems (Bronfenbrenner, 1979).

Though scholars typically begin discussion of EST by first describing the inner microsystems, the problem of practice can best be understood by working in the opposite direction and beginning with the chronosystem (Bronfenbrenner, 1979). The knowledge economy requires educators and education leaders to communicate and function as a networked, 21<sup>st</sup> century profession rather than an industrial-era bureaucracy (Mehta, 2013a). However, this requirement to operate as a profession conflicts with the socio historical culture on which the American public education system bases its identity.

Over time, through the events that comprise the chronosystem (Bronfenbrenner, 1979), schools developed an organizational culture that values procedural knowledge and the completion of routine tasks (Mehta, 2013a); and yet, the societal, political, and economic forces associated with the macrosystem of the knowledge economy clashes with those established cultural norms. Moreover, whether in the form of pressures from

state or federal mandates (Fulmer & Turner, 2014) or the introduction of new technologies (Zhao & Frank, 2003), exosystems impact the setting and culture in which the micro and mesosystems interact within district and school settings (Bronfenbrenner, 1979). As a result of the conflict between the chrono, macro, and exosystems, educators lack sufficient social networks between the micro and mesosystems to communicate an understanding of instructional innovation such that the ideas diffuse throughout the district's ecosystem (Rogers, 2004a). Therefore, the problem of practice exists as a result of the impact that these nested ecological systems have on the networked communication between leadership stakeholders within the districts. The remainder of this chapter describes the details of these nested systems and the ways in which they affect the networked interactions between central office and building leaders at the micro and mesosystem levels.

### **Chronosystem: The History of the Organizational Culture of Schools**

According to Bronfenbrenner (1979), the chronosystem exists as the outermost structure of the ecology and describes the socio historical events that influence the development of the focal individual or organization. Within the context of American K-12 public education, the chronosystem began with the establishment of the Common School in the 1840s by Horace Mann, ultimately creating the notion of a unified public education system (Tyack & Cuban, 1995). By the middle of the twentieth century, what began as loosely coupled one-room schools had ballooned into a decentralized, secular system designed to prepare workers for an industrial economy (Cuban, 2013), and yet it “was not a seamless system of roughly similar common schools but instead a diverse and



unequal set of institutions that reflected deeply embedded economic and social inequalities” (Tyack & Cuban, 1995, p. 22).

Key events influenced by an industrial era macrosystem comprise the chronosystem of American public education. Beginning in the 1860s, the idea of graded schools emerged in response to urbanization (Tyack & Tobin, 1994). These schools mirrored the hierarchy of society and instigated what came to be known as the *batch-processing* of students by age (Tyack & Tobin, 1994). In 1893, the Committee of Ten — a group of scholars from major American universities — further institutionalized public education by proposing a standardized curriculum to better prepare students to enter college or the workforce (Tyack & Cuban, 1995). The culture of efficiency and standardization that characterized the industrial era ultimately manifested itself in the introduction of the Carnegie Unit in 1906. This development formalized the use of time and credit as a standard measurement for every curricular unit (Tyack & Tobin, 1994).

Many of the tenets of school administration still in use today can be traced to the principles of scientific management that emerged in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries (Marzano, Frontier, & Livingston, 2011). Using a "factory metaphor" (Marzano et al., 2011, p. 14), reformers such as Ellwood Cubberly and Edward Thorndike advocated for the use of measurement and data to assess the productivity of schools and teachers. This philosophy institutionalized the notion that children should be viewed as products to be uniformly fashioned to meet a set of specifications provided by industry (Marzano et al, 2011). As a result, the construct of learning became institutionalized and synonymous with the act of progressing lock-step through a standardized curriculum (Tyack & Tobin, 1994).

In his seminal book, *Democracy in Education*, John Dewey (1916) warned of creating a schism between information gained in school and life's experiences. He presented a vision of education organized around essential questions and ideas, where teachers and researchers collaborated to create communities of inquiry (Mehta, 2013a). At the same time, Edward Thorndike emerged as the educational leader of the time (Lagemann, 1989), and described teachers as the individuals to implement the plans of administrators as well as ensure that students gained knowledge in measurable ways (Thorndike, 1906). Educational historian Ellen Condliffe Lagemann (1989) insists, "one cannot understand the history of education in the United States during the twentieth century unless one realizes that Edward L. Thorndike won and John Dewey lost" (p. 184).

The historical drivers that influenced the advent of public education during the industrial era (Tyack & Cuban, 1995) continue to impact the cultures and underlying ideologies (Bronfenbrenner, 1979) that drive the interactions of teachers, administrators, and students today. Unlike other professions, teachers and administrators became entrenched in the system and culture of school as students (Tyack & Cuban, 1995), forming mental models as they observed classroom practices (Bandura, 1986) before ever entering the profession. Over time, the organizational culture of schools has evolved as a result of the "systemic memory inherent in the system" (Johnson, 2008, p. 6).

However, today's world does not resemble that of previous generations, and the institution of public education in the United States never intended to prepare students for the intellectual and technological demands of the knowledge economy (Levy & Murnane, 2013). In large part, the American public education system continues to mirror the

industrial era values of standardization and efficiency as evidenced by the omnipresent culture of hierarchical control, compartmentalized curriculum, and standardized assessments (Tyack & Tobin, 1994). The authors of the *Worldwide Educating for the Future Index* (Walton, 2017) referenced earlier in this chapter assert that if the current system emerged to meet the needs of an industrial economy, then a new model must be devised to prepare students for the demands of an innovation era. This dichotomy between the industrial and knowledge economies epitomizes the conflict between the chrono and macrosystems in public education. The next section will further explore the impact of this incongruity on the problem of practice.

### **Macrosystem: The Challenge of the Knowledge Economy**

At the 2016 World Economic Forum in Davos, Switzerland, scholars, thought-leaders, and entrepreneurs announced the arrival of a new era: The Fourth Industrial Revolution (Schwab, 2016). They argued that unlike previous revolutions, this new one will impact society, politics, culture, the economy, and consequently education, at previously inconceivable speeds (Schwab, 2016). In response to the emergence of this new macrosystem, scholars at the World Economic Forum called for students to not only acquire traditional literacies but also more advanced cognitive skills to prepare them for a knowledge-based economy (World Economic Forum, 2015).

Whereas schools formed their identities in response to the political, social, and economic events of an earlier era (Fusarelli & Fusarelli, 2015), the macrosystem of the knowledge economy began to impact society in the 1960s. A turning-point occurred when computerization entered the labor market and began to transform the task requirements for workers (Autor et al., 2003). As the cost of technology plummeted over

subsequent decades, jobs that could be performed accurately and quickly by a machine programmed to follow an explicit set of rules disappeared. Simultaneously, the demand increased for more educated workers who excelled at non-routine tasks that require “flexibility, creativity, generalized problem-solving, and complex communication” (Autor et al., 2003, p. 1284).

This trend continued throughout the first decade of the 21<sup>st</sup> century (Autor & Price, 2013). In an update of their original research, Autor and Price (2013) not only uncovered a continued decline of routine cognitive and manual tasks but also a leveling-off in the demand for the non-routine cognitive and intrapersonal tasks required of workers. This latter discovery may be further explained by British economists Frey and Osborne (2013). They extend the economic models of Autor et al. (2003) to account for advances in big data, robotics, and artificial intelligence as well as the off-shoring of low-skilled cognitive tasks. As advances in these fields continue, Frey and Osborne (2013) project that entire sectors of the workforce will become automated or off-shored leading to a “hollowing-out” (p. 3) of the labor market. In the future, workers who demonstrate creative and social intelligence as well as general knowledge that can be applied to varied contexts will have a lower risk of becoming replaced by computers (Frey & Osborne, 2013).

Today, digital technologies continue to play an increasingly important role in the global economy as they have created, replaced, enhanced, and transformed the tasks completed by human workers (Open Society Foundations, 2015). However, as illustrated in a recent study by Harvard professor David Deming (2017), skill-intensive but less social jobs have also started to decline given the advances in technology. This study

further emphasizes the need for students to develop both non-routine cognitive skills as well as non-cognitive or social-emotional capacity (Deming, 2017).

The 1983 *A Nation At Risk* report intrinsically linked education to economic success (Mehta, 2013b) and called for students to become competitive in the Information Age — an era characterized by rapid advancements in technology, global connectedness, and a knowledge-based economy (Levy & Murnane, 2013). Although the knowledge economy requires changes in the institution of education (Meyer, 2006), this new macrosystem conflicts with the organizational structures that have evolved as a result of the socio historical culture formed by the chronosystem. In response, the International Society for Technology in Education (ISTE), the Partnership for 21st Century Skills (P21), and the Deeper Learning Network have recommended standards, guidelines, and best practices to foster students' creative problem-solving and their ability to use technology to complete new non-routine tasks (Gordon, 2014).

The *Study of Deeper Learning: Opportunities and Outcomes* (Zeiser, Taylor, Rickles, & Garet, 2014) serves as one of the first empirical studies to provide evidence of what students may achieve within the constraints of the existing education system when classroom practice focused on both the acquisition of content knowledge as well as critical knowledge economy skills (Zeiser et al., 2014). Using a quasi-experimental design, the researchers examined a group of high schools that embraced the cognitive, interpersonal, and intrapersonal goals of deeper learning as compared to traditional public schools within the same socioeconomic and geographic areas (Zeiser et al., 2014). Students from the Deeper Learning schools consistently scored higher on both the Organisation for Economic Co-operation and Development (OECD) Program for

International Student Assessment (PISA) test intended to assess critical thinking and problem-solving as well as the state assessments for English Language Arts (ELA), mathematics, and science. Additionally, students who attended Deeper Learning schools reported greater collaboration skills, increased motivation, and higher academic achievement as well as more frequent opportunities to engage in intellectually demanding and authentic tasks (Zeiser et al., 2014).

However, evidence of the industrial era macrosystem can still be found in the accountability and testing movements present today (Fusarelli & Fusarelli, 2015; Lagemann, 1989). Despite the need for students to develop problem-solving, communication, and creativity skills (Levy & Murnane, 2013), many teachers and administrators cite the pressures to perform on standardized tests or complete prescribed curriculum as a rationale for why they cannot embrace new classroom practices (Fulmer & Turner, 2014). However, empirical evidence from a multi-year study of 400 classrooms from 19 elementary schools in Chicago suggests that the argument may be false (Newmann, Bryk, & Nagaoka, 2001). In their seminal study, Newmann et al. (2001) analyzed the intellectual demands of over 2,000 assignments given to 5,000 students and concluded that classrooms with high-quality, intellectually-challenging assignments consistently outperformed those with low-quality ones. These results would suggest that placing increased emphasis on more authentic, intellectual work would ultimately lead to gains on mandated tests (Newmann et al., 2001) as well as improved acquisition of knowledge economy skills.

Both the previously mentioned *Study Of Deeper Learning: Opportunities and Outcomes* (Zeiser et al., 2014) as well as a meta-analysis of Science, Technology,

Engineering, and Math (STEM) courses at the university level (Freeman et al., 2014) corroborate the findings of (Newmann et al., 2001). In the latter study, students in active-learning courses who engaged in deeper inquiry performed almost half of a standard deviation better than those in lecture courses. Additionally, failure rates increased by 55% in traditional, lecture-based courses as opposed to active learning situations (Freeman et al., 2014).

As the demand for a more educated workforce continues, students will increasingly require these types of active learning opportunities (Mehta, 2013a). However, this call for new instruction directly conflicts with the American history of “close-ended, apply-and-recall kinds of questions” (Mehta, 2013, p. 476) established by the chronosystem. Despite the evidence from Newmann et al. (2001a), Freeman et al. (2014), and Zeiser et al. (2014), that more intellectually demanding, student-centered work improves student performance, teachers and administrators continue to adhere to the traditional system. The world outside of America's public education system has transitioned into the macrosystem of the knowledge economy and issued a call-to-action for students to engage in authentic, project-based, intellectually-demanding learning experiences (Walton, 2017). Conversely, most American public schools and districts continue to operate as hierarchical bureaucracies designed to prepare students for an industrial economy that no longer exists (Soulé & Warrick, 2015; Weeres & Kerchner, 1995).

### **Exosystem: The Influence of Technology**

In his nested model, Bronfenbrenner (1979) asserts that exosystems refer to external settings that influence the interactions between the micro and mesosystems. For

example, he claims that education policy represents an exosystem that may influence the interactions between the student and teacher or teacher and parent; and yet, those individuals do not directly participate in the creation of the policy exosystem itself (Bronfenbrenner, 1979). Similarly, the previously mentioned study of the Foundations for Young Adult Success framework recognized that environmental, political, and societal exosystems influenced students' experiences as they developed critical competencies for the future (Nagaoka et al., 2015). However, throughout the existence of the American public education system, few external structures have impacted the interactions and relationships between individuals in schools as much as computers and modern technology (Collins & Halverson, 2010).

Historically, successful educational innovations addressed existing structures rather than learning, teaching, and leadership (Cohen & Ball, 2000 as cited in Peurach, Winchell Lenhoff, & Glazer, 2016). Throughout the 19<sup>th</sup> and 20<sup>th</sup> centuries, new technologies such as chalkboards, textbooks, and common assessments validated the existing bureaucratic structures and classroom practices (Collins & Halverson, 2010) established by the chronosystem. Twenty-first century technologies, however, challenge existing norms such as age-grading, curriculum sequencing, and standardized assessment, directly contradicting many of the elements on which schools base their identities. Further, the immediacy and ubiquity of access to information provided by new technologies allows anyone to become a learner from practically any place, at any time, and from any other person (Collins & Halverson, 2010). The current American school system, built on a notion of a fixed amount of knowledge disseminated by the teacher, must now confront the “challenges involved when a technology movement seeks to



redefine learning in the face of a vibrant, pre-existing institutional structure" (Collins & Halverson, 2010, p.18).

Exosystems influence the context in which individuals participate (Neal & Neal, 2013). According to Zhao and Frank (2003), the introduction of computers into the environment of schools closely resembles that of an invasive species. To test this ecological perspective, the authors conducted a study of technology use in 19 elementary schools within four districts in one Midwestern state between 1996 and 2001. They found that when introducing technology, tools that require little change in practice tend to be assimilated more quickly as teachers chose to use tools in ways that maximize their benefit while reducing the amount of time expended. If the teaching ecosystem values more traditional, teacher-led instruction, then the invasive species of technology may be resisted as it conflicts with the values and beliefs held by the members within the environment (Zhao & Frank, 2003).

These findings stand in stark contrast to the intent behind numerous technologies introduced into education in the 1980s and 1990s. Early tools intended to create learning communities and foster more participatory, active learning for students. Jenkins, Clinton, Purushotma, Robison, and Weigel (2006) advocated that as students gain increased access to media, they can actively participate in a culture that values creation, civic engagement, sharing and informal mentorships. This idea stemmed from the notion that learning might best occur within knowledge building communities where computers could scaffold the process of constructing understanding and connecting students with other learners (Scardamalia & Bereiter, 1994). Technology offered the potential for students to engage in the types of learning experiences that researchers felt would be most

meaningful: project-based, situated in authentic contexts, social in nature, and offering opportunities for the construction of various learning artifacts (Bruckman, 2005). However, these ideals directly conflicted with the institutionalized organizational culture of American public education.

To identify the factors that facilitate or detract from teachers' willingness to integrate technology into their practice, Zhao, Pugh, Sheldon, and Byers (2002) conducted an assessment of the effectiveness of technology grant projects. First, they surveyed 118 grant recipients to determine their comfort with technology, prior experience, attitudes towards technology, and pedagogical styles. Then, they interviewed a subset of 32 teachers to focus specifically on previous experience, motivation, and anxiety about the proposed technology project. Finally, the researchers conducted surveys, interviews, and observations with ten of the recipients based on their geographical location, grade level, and content area. The authors discovered that without a supportive ecosystem, teachers might continue to use new tools for administrative functions or more traditional, teacher-led instruction (Zhao et al., 2002) rather than in student-centered ways that would support the acquisition of knowledge economy skills. Though these studies document the introduction of computers into schools, the next section describes the continued challenges associated with the systemic integration of digital technologies into the ecosystem of districts.

### **The Digital Usage Gap**

Though computerization entered the labor market in the 1960s (Autor et al., 2003) and instigated the macrosystem of the knowledge economy, it did not begin to penetrate education until decades later (Atwell, 2001). This digital technology movement has

caused educators to conceptualize new approaches while bureaucratic controls such as standardized assessments have reinforced existing structures and inhibited innovation (Collins & Halverson, 2010). Though the Clinton administration E-rate Program, the National Digital Empowerment Act, and the Federal Communications Commission (FCC) implemented programs to increase computer and Internet connections into schools throughout the 1990s, by the start of the 21<sup>st</sup> century, policy makers, corporations, and philanthropists began to acknowledge the threat of a *Digital Divide* — “a technology gap between the ‘information haves’ and the ‘information have nots’” (Atwell, 2001, p. 252). The 2016 *National Educational Technology Plan* (U.S. Department of Education, 2016), further warns that a widening digital-use divide exists in terms of how students employ these new technologies for active creation versus passive consumption and acknowledges that access alone will not guarantee the educational attainment required for success in a knowledge economy (U.S. Department of Education, 2016).

Since the early 1990s, despite the influence of technology within the ecosystem of schools, educators and policy makers have perceived a disconnect between access and usage (Cuban, Kirkpatrick, & Peck, 2001). Larry Cuban, professor emeritus at Stanford University, first quantified the notion of a usage gap in his empirical study of two Silicon Valley high schools. Through surveys, interviews, and classroom observations, Cuban et al. (2001) discovered that only 25%-32% of teachers accounted for 60-70% of all computer use in those schools. Students reported minimal technology use in most of their classes with the exception of teacher presentations and videos. Teacher interviews and observations revealed that while 60% of respondents professed that technologies made the administration of their jobs more efficient, only 30% stated that they had

changed their classroom instruction (Cuban et al., 2001). During the 2016 school year, Cuban revisited this study and conducted interviews as well as focus groups in 41 Silicon Valley Schools. Though 65% of educators asserted that their classroom practice had changed as a result of increased technology access, Cuban (2018) described these changes as incremental and largely administrative. Further, he stated that only one of the 37 teachers that he interviewed and observed described any significant change in instruction or classroom culture (Cuban, 2018).

Though Cuban's work documented a usage gap within Silicon Valley schools, Warschauer (2004) as well as Hohlfeld, Ritzhaupt, Barron, and Kemker (2008) uncovered significant usage discrepancies across districts. Where Warschauer (2004) compared a sample of low and high socioeconomic status (SES) districts in California, Hohlfeld et al. (2008) applied a similar methodology in Florida. Both sets of researchers found little discrepancy between the number of computers and Internet connections across the schools; however, they uncovered significant differences in terms of the types of available software, the level of support for teachers, and the activities that students completed. In low SES schools, student activities primarily addressed specific software skills such as formatting documents or designing presentations, a trait that the researchers defined as irrelevant for a global economy (Warschauer, 2004). Additionally, students in low SES schools used more content-specific software for information acquisition and remediation rather than the productivity-type tools that encouraged students to problem-solve, demonstrate critical thinking, and engage in complex communication (Hohlfeld et al., 2008).

Using seven years of longitudinal data collected by the Florida Department of Education: Technology Resource Inventory (TRI), Hohlfeld, Ritzhaupt, Dawson, and Wilson (2017) sought to determine whether these digital divide concerns persisted over time. Though it appears as though students in low and high SES schools now have equitable access to modern computers, laptops, and mobile devices — a phenomenon that the authors closely aligned to the rise of online standardized testing — a discrepancy does exist in terms of available software. Students in high SES schools continued to have more opportunities to use technology for student creation, research, and problem-solving, especially at the elementary level. Conversely, students in low SES schools use technology more for drill and practice or remediation instead of active creation and research. The researchers attribute this difference to the discrepancy in technology skill detected between low and high SES students as well as their teachers (Hohlfeld et al., 2017). The findings of this study corroborate earlier studies into the impact of the digital divide (Hohlfeld et al., 2008; Warschauer, 2004; Warschauer & Matuchniak, 2010).

For students to gain the non-routine cognitive skills required to harness the routine capabilities of computers (Autor et al., 2003), they need the opportunity to use rather than just consume technology (U.S. Department of Education, 2016). However, after analyzing hundreds of wikis (websites that allow for collaborative editing) randomly selected from a pool of 180,000 published education wiki sites, Reich, Willett, and Murnane (2012) ascertained that the majority of teachers struggled to use new technologies in novel ways rather than to extend existing routines. Most teachers employed wiki technology to improve the efficiency of their own practice rather than to engage students in knowledge co-construction, solving unstructured tasks, or complex

communication. In their sample, only 1% of wikis supported student communication, collaboration, and multimedia creation indicating that most teachers failed to integrate this new technology in ways that encouraged student creativity, knowledge construction, and problem-solving (Reich et al., 2012). These findings mirror those of Cuban et al. (2001) and Cuban (2018). Although technology may be infiltrating the ecosystem of school, it has failed to make a systemic impact on classroom instruction to prepare students for the knowledge economy.

The challenges associated with the exosystem of technology outpacing pedagogy presents a new dilemma for American public school systems (Mishra & Koehler, 2006). Students require an education to prepare them for the new cognitive and technological challenges of the knowledge economy (Autor et al., 2003; Levy & Murnane, 2013; World Economic Forum, 2015; U.S. Department of Education, 2016), but the practices and tools associated with this new era contradict previously held organizational structures, cultures, and beliefs (Collins & Halverson, 2010). Today's students not only require access to technology but also the opportunity to use it in meaningful ways (Walton, 2017; World Economic Forum, 2015; U.S. Department of Education, 2016). However, adopting new pedagogies that would create the conditions for these learning experiences presents a dilemma for teachers and administrators as it breaks from established routines and standards (Collins & Halverson, 2010).

### **Technology and Educator Identity**

Most educators formed their identities as professionals within the monoculture of American schools (Campbell, 2000) that historically valued teacher-directed learning, analog practices, and norms such as age-based grading and curriculum sequencing

(Collins & Halverson, 2010) established by the chronosystem of public education.

However, educators now find themselves facing a macrosystem characterized by rapid advancements in technology, global connectedness, and a knowledge-based economy (Levy & Murnane, 2013). Unlike the analog tools of previous eras, the exosystem of digital technology associated with this macrosystem of the knowledge economy directly conflicts with the structures on which teachers base their identities (Collins & Halverson, 2010).

When a social event or external setting — such as the influx of technology into the system of schools — creates a psychological crisis, individuals begin to reconsider their world view (Sue & Sue, 2013). Sue and Sue (2013) describe this internal conflict in their Racial/Cultural Identity Development (R/CID) Model as a period of dissonance when an individual's new experience contradicts their previously held beliefs. When this occurs, they argue that individuals might progress through phases of resistance and immersion, rejecting the dominant views of society, before potentially engaging in introspection and eventually an overarching awareness of their new condition (Sue & Sue, 2013).

Unfortunately, many educators reject the introduction of new technologies and cling to previously held beliefs about teaching as evidenced by a qualitative case study conducted by Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, and Sendurur (2012). The authors used a purposive sample of 12 award-winning, K-12 classroom educators chosen for their demonstrated use of technology to create student-centered, active-learning experiences. When asked to rate the impact of various barriers to innovation with technology, nine of the twelve respondents suggested that while external factors such as

money, state standards, and time posed some challenge, the attitudes and beliefs of educators served as the greatest inhibitor of innovation of classroom practice with technology (Ertmer et al., 2012).

An earlier, large-scale quantitative study supports these claims. The North Carolina IMPACT study (Overbay, Patterson, Vasu, & Grable, 2010) sought to determine a correlation between teacher beliefs and technology use. They hypothesized that teachers who possess stronger constructivist orientations would use technology more often with students, and in more student-centric ways, given its capacity to support knowledge construction and problem solving. Analysis of survey data from the Activities of Instruction 2.0 (AOI 2.0) and the School Technology Needs Assessment (STNA) instruments revealed that beliefs about constructivist teaching practices positively correlated with increased technology use. However, across the sample of educators ( $n=474$ ), significant differences in belief were reported across gender, subject area, and grade level (Overbay et al., 2010).

Since most educators formed their knowledge and perceptions of education as students within an industrial-era system, many may reject the culture of active-learning and student creation that accompanies the implementation of new technologies and do not view these beliefs as necessary components of their conceptualization of an effective teacher (Ertmer & Ottenbreit-Leftwich, 2010). Much like the way that the chronosystem underlying the institution of education conflicts with the macrosystem of the knowledge economy, it also clashes with the exosystem of digital technology. In turn, the exosystem of technology directly impacts the relationships that occur within the social networks that



support communication between the micro and mesosystems of the individuals within districts and schools.

### **Micro and Mesosystems: The Networked Interactions between Individuals**

Historically, policy makers viewed schools as complicated systems with component parts that could be tweaked rather than as dynamic, complex organizations (Cuban, 2013) that learn and adapt (Senge & Kim, 2013). According to Johnson (2008), complex systems, “balance between stasis and entropy” (p.6). Districts and schools — as well as the individuals residing within them — respond to the social, political, and economic pressures associated with Bronfenbrenner’s (1979) nested outer systems. Minor changes in an outer layer can have a major impact on the dynamics within the inner systems (Johnson, 2008). However, macrosystems such as the economy and society have attempted to influence the social organization of schools for decades but with minimal impact on classroom instruction (Cuban, 2013). Further, when presented with exosystems like digital technologies, educators often assimilate new tools to fit traditional structures, or reject them from the ecosystem, rather than change existing practice (Zhao & Frank, 2003) and beliefs (Ertmer et al., 2012).

Despite the intentions of these macro and exosystems to shift districts from a traditional model of schooling towards more interactive instruction designed to foster critical thinking and problem solving skills, districts rarely systemically make that pedagogical shift (Diamond, 2007). Relationships between individuals in districts form a set of “mutual dependencies” (Bryk & Schneider, 2003, p. 41) that then define the social exchanges within the ecosystem; and the personal interactions between the networks of educators and leaders impact how individuals within an organization respond to change

(Johnson, 2008). Using data from the multi-year Distributed Leadership Project that analyzed eight Chicago Public elementary schools during the 1999-2000 school year, Diamond (2007) conducted observations and interviews with teachers and administrators in 105 second–fifth grade classrooms to determine which factors most strongly influenced teachers' instructional decision making. Teachers stated that principals, assistant principals, and other teachers influenced their instruction, not the intended policies (Diamond, 2007), indicating that fostering learning and communication between the micro and mesosystems of a district may be critical to implementing systemic innovation.

To better understand how knowledge of innovation flows through schools to support the adoption of more student-centered, constructivist teaching methods with technology, Frank, Zhao, Penuel, Ellefson, and Porter (2011) also used an ecological framework. Extending the seminal research from Garet, Porter, Desimone, Birman, and Yoon (2001) into the effectiveness of professional development, the authors hypothesized that teachers require a system of support in addition to focused opportunities for hands-on learning. They identified a purposive sample of 25 elementary schools from 10 districts in one Mid-Western state that had previously received money to invest in technology and professional development. In addition to collecting survey data, the researchers conducted semi-structured interviews with all 10 superintendents and technology directors, one principal from each district, and 3-5 teachers per district. They also observed professional development sessions in each school. Their analysis revealed that members within the organization participated in a three-part evolution before new practices started to spread. First, learning began when an external person conveyed

focused, relevant knowledge to the teacher. Then, the teacher adopted the idea and adapted the practice to their context. Finally, knowledge of the new practice spread throughout the school through interactions with others (Frank et al., 2011). This study, in conjunction with that of Diamond (2007), suggests that communication — and the social networks to support it — serve as a necessary component to support systemic change.

Though the previous two studies examined the interactions of teachers within schools to communicate new ideas, Goddard, Goddard, Sook Kim, and Miller (2015) examined the role of the principal to foster that teacher communication and collaboration. They found that instructional leadership had a positive correlation with teacher collaboration for instructional improvement (Goddard et al., 2015). According to Spillane, Kenney, and Kim (2012), the literature may incorrectly assume that the principal plays the role of instructional leader. The authors used social network theory to examine whether or not formal leadership does actually impact instructional change. Over a two-year period, they collected data from staff in 30 elementary schools within one large district to determine the structure of networks to support communication. Despite evidence such as that presented by Goddard et al. (2015), Spillane et al. (2012) found that principals did not always play a central role in teacher networks. Because they did find a positive association between the number of people seeking information from the principal and the overall level of network activity, the authors inferred that when a formal leader plays a more active role in the network then they improve collaboration and communication (Spillane et al., 2012).

At the district level, a case study to examine the social networks of knowledge transfer between the central office and school buildings revealed that systemic change

requires communication throughout the system and not only within individual buildings (Daly & Finnigan, 2010). According to that study, dense communication connections between the nodes in the network increases an organization's capacity for change. Conversely, when sparse ties existed between district and building leaders, the overall structure of the network centralized to the central office where the district leaders played more of a transactional role to dispense information. Daly and Finnigan (2010) found that in weak districts, little knowledge sharing occurred between buildings, and the central office lacked a feedback mechanism to know whether messages actually spread to the individual teachers. Since teachers largely rely on the principal as the conduit for direction and information, within a district network architecture, the principal plays a central role in fostering communication throughout the ecosystem (Daly, Moolenaar, Bolivar, & Burke, 2010).

### **Traits of Innovative Systems**

In *Beyond PD: Teacher Professional Learning in High-Performing Systems* (Jensen, Sonnemann, Roberts-Hull, & Hunter, 2016), a report prepared by members of the National Center on Education and the Economy (NCEE), the authors compare the high-performing educational systems — as determined by the 2012 PISA tests — of Hong Kong, British Columbia, Shanghai, and Singapore to examine the role of professional learning on student improvement (Jensen et al., 2016). Despite the fact that each system represented a different culture and geography, they all exhibited commonalities in their definition and execution of professional learning. Each viewed it as a system of improvement involving teachers, administrators, and government leaders dedicated to ensuring that progress can be measured, documented, and achieved (Jensen

et al., 2016). These findings corroborate earlier claims by Mourshed et al. (2010) that excellent systems function as transparent, professional communities dedicated to improving student learning.

To identify the intervention clusters that allow an education system to make sustained and widespread improvement in student achievement, Mourshed et al. (2010) analyzed 20 international systems that progressed along a continuum - *Poor to Fair, Fair to Good, Good to Great, and Great to Excellent* - to determine not only what led to systemic success but also how the systems implemented their chosen interventions. As systems progress from *poor to fair*, they ensure that students achieve basic literacy and numeracy. When advancing from *fair to good*, financial, organizational, and accountability systems become consolidated and centralized to increase accountability for student learning. Key tenets of great systems include the establishment of professionalism within the sector and the development of human capital to support student learning. These tenets emerge as a result of apprenticeship opportunities and professional communities dedicated to building a common language for instruction that extends beyond isolated strategies or techniques. Excellent systems then leverage the human capital, sense of professional community, and shared language of great systems to foster a culture of innovation (Mourshed et al., 2010).

To attain this level of internal coherence and instructional improvement requires structures and processes to ensure sustained change and support (Elmore, Forman, Stosich, & Bocala, 2014) between the micro and mesosystems of teachers, building-level leaders, and central office administrators. Further, ensuring systemic innovation will require districts to function more as learning communities dedicated to communication

and knowledge diffusion (Senge & Kim, 2013) and less as "monolithic, bureaucratic structures" (Honig, 2006b, p. 629). New classroom instruction needs to occur within an organizational system that can support it (Martinez et al., 2016).

While stringent bureaucratic hierarchies may be effective for managing organizations during times when workers execute routine tasks such as during the industrial era (Mehta, 2013a), when job requirements become more complex, organizations require a more decentralized, flexible structure (Mintzberg, 1989). Unfortunately, American public school districts experience more bureaucratic controls than most other professions, imposing limitations on teachers and often interfering with the types of classroom practices that would be of benefit to students (Mintzberg, 1989). On the contrary, innovative organizations can often be characterized as possessing an entrepreneurial orientation (EO) (Brettel, Chomik, & Flatten, 2015) — a desire to engage in divergent thinking that breaks from old routines and standards (Mintzberg, 1989).

In a quantitative study of Small Medium Enterprises (SMEs) from the German Chamber of Industry and Commerce, Brettel et al. (2015) investigated the role of organizational culture in determining the amount of innovativeness, proactiveness, and risk-taking required to determine the EO of an organization. The authors found that a hierarchical culture, such as that which characterizes most public school systems, had a negative effect on EO and recommended that organizations promote a culture of change and development if they intend to become more entrepreneurial. Additionally, when an organization values creativity and promotes learning, it develops a culture of entrepreneurial values that ultimately increases its innovativeness (Brettel et al., 2015). Though SMEs in Germany provided the context for this study, Mourshed et al. (2010)

applied similar thinking to education. As mentioned, great education systems operate as professional organizations, and excellent ones function as learning communities that foster innovation and more entrepreneurial endeavors (Mourshed et al., 2010).

To ensure sustained, systemic innovation will require strategic and structural supports in addition to an entrepreneurial orientation (Shepherd, Patzelt, & Haynie, 2010). If the central office and building leadership do not champion innovation, or provide the resources to communicate it, then organizational efforts will most likely result in pockets of excellence where some teachers embrace new practices while others continue the status quo (Albion, Tondeur, Forkosh-Baruch, & Peeraer, 2015). Shepherd et al. (2010) refers to this as the “deviation-amplifying relationship between the entrepreneurialness of the manager’s mindset and the organization’s culture” (p. 60). Considering the inability of districts to implement systemic innovation through the lens of these *entrepreneurial spirals* (Shepherd et al., 2010), it could be hypothesized that innovation may be thwarted because of breaks in the social networks that support the flow of communication between the hierarchical layers of the district ecosystem.

### **Systems Leadership and Organizational Learning**

To prepare students for the demands of the knowledge economy will require professional expertise rather than the adjustment of bureaucratic levers (Mehta, 2013a) as well as systems leaders who can foster transformational leadership, adjust with varying conditions, and learn collectively (Senge, Hamilton, & Kania, 2015). This requires central office and building leaders to communicate and collaborate such that innovation no longer occurs only in silos (Honig & Rainey, 2015). In an organizational learning community, central office administrators may start this process, but building leaders

capable of handling complex, rapidly changing environments and dedicated to both the entire ecosystem as well as their individual schools (Fullan, 2002) will need to perpetuate the *entrepreneurial spirals* (Shepherd et al., 2010) throughout the ecosystem of the district. Diffusing innovation throughout the system therefore requires leaders who can act as brokers to translate policy into practice and boundary-spanners to maintain communication throughout social networks (Daly, Finnigan, Moolenaar, & Che, 2014).

However, systems leaders require the tools to support and sustain communication between the micro and mesosystems as well as diffusion of their knowledge and vision (Senge et al., 2015). In his seminal book, Rogers (2004b) articulated that diffusion of an innovation occurs inside these existing structures as a result of social pressure. Both Diamond (2007) and Frank et al. (2011) corroborate this idea as their studies showed that teachers rely on communication with their colleagues and principals, rather than external policies, to adopt new practices. According to policy diffusion theory (McLendon, Cohen-Vogel, & Wachen, 2015), a social community can support the spread of a reform to disparate stakeholders by creating a positive policy environment and leveraging coalitions to spread change.

Districts need to be designed to support more transformational leadership, higher quality teaching, and deeper learning to realize innovation across an entire system (Honig & Rainey, 2015). This redesign of the organization would move districts away from traditional bureaucratic structures (Honig, 2006b) and towards organizational learning communities dedicated to building and sharing collective knowledge (Senge & Kim, 2013). In a traditional organization, theory-building, practice, and capacity-building exist as fragmented components of a fractured system. An organizational learning community



bridges these three worlds to improve communication, distribute knowledge, and sustain systemic improvements (Senge & Kim, 2013). As will be described in the intervention literature, to improve communication throughout the district will require tools to illustrate the larger system, to foster communication throughout social networks, as well as to help leaders shift from “reacting to co-creating the future” (Honig & Rainey, 2015, p. 31).

### **Conclusion**

In his seminal book, Bronfenbrenner (1979) contends that to comprehend the development of a child requires a deep understanding of the interdependent systems that impact his or her ecosystem. Similarly, to grasp the complexity of an American public school district necessitates an analysis of the interdependent systems that both shape and conflict with the structures that form its identity. Progressive thinkers in the early 20<sup>th</sup> century argued that school should prepare students to *learn how to learn* (Tyack & Tobin, 1994). Beginning with Reagan’s *A Nation at Risk Report* and continuing through Obama’s *Race to the Top*, policymakers have advocated for improving student performance to prepare for the intellectual demands of the knowledge economy (Fusarelli & Fusarelli, 2015), and yet education reformers have claimed that schools continue to fail in their primary mission of ensuring that students *learn how to learn* (Chubb & Moe, 1990). Most recently, the World Economic Forum (2015) and the *Worldwide Educating for the Future Index* (Walton, 2017) have issued calls-to-action for the education systems of the world: schools need to prepare their students for the cognitive and technological demands of the future and to *learn how to learn*. Despite these edicts and policies, and though computerization has transformed the macrosystem of the knowledge economy, digital technologies have not yet had the same level of penetration within the ecosystems

of schools (Cuban et al., 2001; Hohlfield et al., 2008; 2017; Reich et al., 2012; Warschauer, 2004). Instead of adapting with this new era, the American K-12 public education system has largely remained fixed in the bureaucratic model (Honig, 2006b; Mehta, 2013a; Soulé & Warrick, 2015; Weeres & Kerchner, 1995) established by its chronosystem.

As presented by the literature, this problem of practice can be attributed to competing interdependent systems at the macro, chrono, exo, meso, and micro levels. More specifically, the researcher hypothesized that systemic innovation could be thwarted due to the hierarchical bureaucratic structures of districts preventing communication through the social networks. To examine this problem in context, the author conducted an explanatory, mixed-methods study (Creswell & Plano Clark, 2011) in four small, suburban districts in the Northeastern region of the United States during the fall of 2016 to better elucidate the underlying causes and factors. The needs assessment described in the next chapter examined central office and building leader beliefs about district culture, structures to support teacher innovation of classroom practice, and visions for innovative classroom practice to prepare students for the knowledge economy.

## **Chapter 2**

### **Empirical Analysis of Organizational Structures**

The literature reviewed in the previous chapter used Bronfenbrenner's (1979) Ecological Systems Theory (EST) to describe how interdependent systems drive the problem of practice: district administrators and school leaders lack a shared language to clearly communicate a vision for instructional innovation to prepare students with future skills such that the ideas diffuse throughout the social networks of the district's ecosystem (Rogers, 2004a). This communication failure prohibits school and district leaders from bringing the education system into alignment to meet the disparate demands of the knowledge economy (Honig & Rainey, 2015). To understand the problem in context, from February – May 2016, the researcher conducted observational research in one rural district in New Hampshire, two suburban districts in Chicago, IL, one affluent suburban district in Connecticut, four suburban and one urban district in Massachusetts, as well as three international education technology conferences in San Diego, CA, Washington, D.C., and Johannesburg, South Africa. Through this process, the researcher noticed differences in language and perception between teachers, coaches, principals, and central office administrators around the topics of technology usage and instructional innovation. These observations informed the design of the empirical study described in this chapter.

Using Ecological Systems Theory (EST) (Bronfenbrenner, 1979) as a framework, the researcher conjectured that systemic innovation of classroom practice to prepare students with future skills could be thwarted due to the hierarchical bureaucratic structures of districts preventing communication through the social networks between the micro and mesosystems within the districts. The researcher attempted to discern whether

differences existed between the perceptions of district-level administrators, such as Directors of Technology or Superintendents, and building-level leaders — principals, instructional coaches, coordinators, and teacher-leaders. From September – November 2016, an empirical study explored this concept within a sample of four, small, suburban districts purposively chosen in two states in the Northeastern region of the United States. Since the researcher hypothesized that the problem of practice lay in how the organizational structures of the districts influenced the social interactions between individuals, she assumed that differences in perceptions existed between district and school-level leadership. Therefore, the researcher designed this needs assessment using an explanatory, sequential, mixed-methods design that incorporated both quantitative and qualitative data to gain a deeper understanding of participant perceptions.

According to Creswell and Plano Clark (2011), an explanatory design begins with a quantitative study and then employs a qualitative analysis to explain the rationale behind the quantitative trends or relationships. This study began with an online survey containing both quantitative and qualitative questions followed by a qualitative analysis of each district's technology or strategic plan to triangulate the survey findings and provide additional explanation (Creswell & Plano Clark, 2011). In a mixed methods study such as this, an iterative loop exists between the purpose and the research questions as the initial questions may require revision after collecting data and conducting the initial analysis (Onwuegbuzie & Leech, 2006). Therefore, to address and understand the complex phenomena of systemic innovation, the researcher employed an iterative process when crafting the research questions (Newman, Ridemour, Newman, & DeMarco, 2003) to specifically address the problem under investigation as well as to structure the study

(Onwuegbuzie & Leech, 2006). This needs assessment ultimately addressed the following questions:

RQ1: How do central office and building stakeholders perceive that they currently communicate and collaborate to support teacher innovation of classroom practice?

- Sub-question: How do perceptions differ across districts and position (e.g. central office vs building)?

RQ2: What do central office leaders believe that school-level stakeholders (principals/assistant principals/coaches/educators) need to better support their teachers as they innovate their classroom practice with technology?

- Sub-question: how do their beliefs compare to school-level stakeholders?
- Sub-question: How do those beliefs differ across districts and position within the district (e.g. central office vs building level)?

RQ3: How do central office leaders (Superintendent, Assistant Superintendent, Technology Director), building principals, assistant principals, coaches, and educators describe their vision of innovative classroom practice to prepare students for the knowledge economy?

- Sub-question: How do the descriptions differ across districts and position (e.g. central office vs building)?

## **Methodology**

### **Participants**

The three, international technology conferences observed during the spring of 2016 included over 1,100 Chief Technology Officers, Instructional Technology Directors, Superintendents, Principals, District Teams, Education Service Agencies, classroom

educators, coaches, library media specialists, researchers, and educational technology service providers from across the U.S. and abroad. These individuals represented both private and public schools of varying size, geographic location, and socioeconomic status and helped to inform the direction of this empirical study. The researcher discovered from these events that differences existed in language, vision, and perceptions between respondents, but could not discern whether these differences occurred within the silos of schools as well as between buildings within districts. This revelation informed the sampling methodology, described later in this chapter, and guided the decision to purposefully select four, small suburban districts in two states in the Northeastern region of the U.S. as the sample for this study.

A total of 72 participants from the four districts chosen for the study responded to an online survey ( $n=72$ ). Fifteen respondents did not complete all of the questions, resulting in a total sample of  $n=57$ . Table 1 illustrates the size of the targeted populations within each district, the sample size from each district, and the response rate. The district names have been replaced with pseudonyms and the two states are identified as South and North.

Table 1

*District Samples and Response Rates*

District	Targeted Population	Sample of Respondents	Response Rate
Bridgetown, South	50	25	50.00%
Bayview, North	27	7	25.92%
Eastside, South	29	9	31.03%
Hilltop, North	39	16	41.03%

**District Demographics.** All four districts described themselves as small (6-10 buildings) and suburban (Table 2). Using free or reduced price lunch as a proxy to identify the socioeconomic level of the schools, 25.9% of respondents indicated that less than 10% of their students qualified, 19% responded that 11-30% qualified, 31% reported that 31-50% of students could be eligible, and 24.1% of respondents indicated that they did not know. Based on the responses, Bridgetown has the lowest socioeconomic status of the four districts with most respondents stating that 31-50% of students received free or reduced lunch. Most of the Bayview respondents listed that 11-30% of students qualified as compared to Eastside participants who reported less than 10%. Hilltop respondents indicated the most diversity within the district and reported either less than 10%, 11-30%, or *I don't know*. Whereas most participants from both South state districts reported that less than 5% of their students could be considered English as a Second Language (ESL) learners, the North state districts indicated that 6-10% or 11-20% of their students could be considered ESL learners.

Table 2

*District Demographics*

District	% Of Free or Reduced Price Lunch	% Of ESL Students
Bridgetown, South	31-50%	Less than 5%
Bayview, North	11-30%	6-10% or 11-20%
Eastside, South	Less than 10%	Less than 5%
Hilltop, North	Less than 10% or 11-30%	6-10% or 11-20%

**Sample Demographics.** The sample included both central office as well as building level administrators and educators (Table 3). Central office personnel

represented 22.8% of the sample ( $n=13$ ) and included three superintendents, three assistant superintendents, four educational technology or curriculum directors, and three directors of information technology. The building level personnel ( $n=44$ ) included principals and assistant principals (33.3%); classroom teachers who also served as members of the district leadership/innovation/technology committee (22.8%); and instructional/technology coaches, coordinators, or library media/technology specialists (21.1%).

Table 3

*Sample Characteristics*

Position in the District	Sample Size	Percentage (%)
Central Office	13	22.8%
Superintendent	3	5.3%
Assistant Superintendent	3	5.3%
Educational Technology/ Curriculum Director	4	7.0%
Director of Information Technology	3	5.3%
Building Level	44	77.2%
Principal/Assistant Principal	19	33.3%
Classroom Teachers	13	22.8%
Instructional/Technology coaches, coordinators, or Library Media Specialists	12	21.1%

Each district sample included a mix of central office as well as building level participants. Central office administration represented 42.8% of the sample in Bayview, 20% in Bridgetown, 11.1% in Eastside, and 25% in Hilltop. Bridgetown and Hilltop had the largest and most diverse building-level samples with a combination of principals, assistant principals, and educators taking part in the online survey. In Bridgetown, 28% of



respondents identified themselves as either a principal or assistant principal and 52% as either a classroom teacher or instructional/technology coach. Principals and assistant principals accounted for 56% of the sample in Hilltop, and instructional/technology coaches comprised the remaining 19%.

### **Sampling Methods**

As a result of the observational research conducted during the spring of 2016, it became apparent that perceptions may vary between members within the hierarchy of a district ecosystem. For that reason, this empirical study required a sample consisting of both central office as well as building leaders. Though the researcher considered employing a stratified random sampling method from a national population, this strategy did not seem logistically possible given the time frame of the study. Instead, the researcher conducted this study within four, purposefully selected American, K-12 districts in two Northeastern states.

According to Creswell and Plano Clark (2011), purposeful sampling allows for the intentional selection of participants because of the existence of a central phenomenon. In this study, each of these small, suburban districts previously established committees consisting of central office and building personnel to support innovation of classroom practice to develop students' knowledge economy skills. However, through initial conversations, the Superintendent or Assistant Superintendent acknowledged a lack of shared vision and language — even within the committees — as well as an inability to diffuse ideas about innovation throughout their districts. This revelation, that not all stakeholders within districts held the same conceptions of innovation despite strong central office leadership, indicated the existence of the problem of practice.

Though more often associated with qualitative studies, purposive sampling allows for the selection of groups of participants to specifically address research questions as well as to establish comparisons between cases or subgroups (Teddlie & Yu, 2007) such as in this cross-district analysis. With this mixed methods study, the researcher purposively selected the participating districts using a theoretical sampling technique (Teddlie & Yu, 2007) to study the underlying causes and factors preventing the systemic spread of innovation throughout the ecosystem of a district. While this sampling method allows for more in-depth analysis given the smaller sample sizes, the results may not be generalizable to broader populations (Teddlie & Yu, 2007) outside of small, suburban districts in the Northeastern region of the U.S.

### **Quantitative Measures**

**Perceptions of organizational structures.** As described in the previous chapter, districts need to function more as organizational learning communities (Senge & Kim, 2013) and less as hierarchical bureaucracies (Honig & Rainey, 2015; Mehta, Theisen-Homer, Braslow, & Lopatin, 2015) if they intend to systemically innovate classroom practice to prepare students for the knowledge economy. To measure the ways in which the participants perceived that they function as a learning community that communicates, collaborates, adapts to change, and values innovation (Senge & Kim, 2013), the researcher used select items from the Professional Learning Communities Assessment - Revised instrument (PLCA-R) (Olivier, Antoine, & Cormier, 2009) and the ENTRELEAD survey (Renko, Tarabishy, Carsrud, & Brännback, 2013).

The PLCA-R (Olivier et al., 2009), measures perceptions about shared and supportive leadership, values and vision, as well as conditions for organizational learning.

Though the original research for this revised scale has not appeared in any peer-reviewed journals, the authors presented a discussion of the validity and reliability of the instrument both in conference proceedings as well as in their book. The authors confirmed the reliability of the instrument by determining Cronbach alpha coefficients for each of the factored sub-scales ( $n=1209$ ): *Shared and Supportive Leadership* (.94); *Shared Values and Vision* (.92); *Collective Learning and Application* (.91); *Shared Personal Practice* (.87); *Supportive Conditions-Relationships* (.82); *Supportive Conditions-Structures* (.88); and a one-factor solution (.97) (Olivier et al., 2009, p. 5). An Expert Opinion Questionnaire assessed the revisions to the original PLCA instrument, and qualitative interviews further validated it (Olivier et al., 2009). The complete PLCA-R survey instrument contains 52 items spread across several sub-scales. However, participants in this study only completed the questions from the *Shared Values and Vision* sub-scale. Using a four-point Likert-scale, participants indicated their level of agreement with statements such as *decisions are made in alignment with the school's values and vision* and *a collaborative process exists for developing a shared vision among staff* (Olivier et al., 2009).

Where the PLCA-R assesses the degree to which participants perceive that their organizations functioned as learning communities, the ENTRELEAD scale intends to measure the presence of entrepreneurial leadership (Renko et al., 2013). An organization headed by an entrepreneurial leader exudes a culture of innovativeness, proactiveness, and risk-taking (Brettel et al., 2015), characteristics that would support the spread of innovation (Senge et al., 2015). To establish face validity for the ENTRELEAD instrument, Renko et al. (2013) first assessed a large number of survey items based on a

previous literature review with a sample of 381 employees and students from three, large American research universities. Employees responded to an online survey administered via email, and students completed a paper-based version while attending either a strategy or entrepreneurship class. The authors tested the questions and measured the responses using an exploratory factor analysis resulting in some scale items being discarded (Renko et al., 2013).

A second test used the reliability and factor structure of the first study to create a new instrument which also compared items against the *Supervisory Creative-Supportive Behavior* scale for content validity (Renko et al., 2013). The authors then used process matching to distill the number of survey items down to 10 before conducting an item-to-total correlation. With the second study, the authors calculated a final Cronbach's alpha coefficient of 0.85 to ensure reliability. The survey instructs participants to consider their immediate supervisor and then rate how well the provided statements describe him or her on a seven-point Likert-scale (Renko et al., 2013). In this needs assessment, the researcher modified some statements to make them more relevant to an educational setting. For example, *often comes up with radical improvement ideas for the products/services we are selling* became *often comes up with radical improvement ideas for transforming classroom practice*.

**Perceptions of current practices to foster knowledge economy skills.** Today's knowledge economy requires a highly-educated workforce possessing a new set of non-routine cognitive skills (Levy & Murnane, 2013). However, the researcher hypothesized that a lack of shared language for communicating these skills to teachers may be central to the problem of practice. Using survey questions from the *21st Century Skills/Deeper*

*Learning* element of the *Curriculum, Instruction, and Assessment* sub scale of the Future Ready Dashboard (Alliance for Education, 2015a), the researcher assessed participant perceptions about current district practices to develop these capabilities in students based on their responses to a series of Likert-scale questions.

Using a five-point Likert-scale ranging from *strongly agree* to *strongly disagree*, the first two items asked respondents to rate their level of agreement with statements regarding whether the district had established knowledge economy skills as a learning standard across all levels and communicated those expectations to stakeholders. For example: *Our district has revised all curricula to align with the 21st Century skills*; and *Teachers are provided the resources and support needed to redesign classrooms into innovative learning environments that incorporate the available technologies* (Alliance for Education, 2015a). Participants also rated their perceptions about the amount of emphasis placed on specific knowledge economy skills such as *critical thinking and problem solving, creativity and innovation*, as well as *global and cultural awareness* by responding to a four-point scale that ranged from *strong emphasis* to *no emphasis* (Alliance for Education, 2015a).

Researchers from the Meteri Group, a for-profit consulting firm, developed the survey questions for the Future Ready Dashboard in collaboration with the American Institute for Research (AIR). They based their questions on the U.S. Department of Education's Office of Educational Technology research-based rubric for school and district leaders. According to the published research synthesis (U. S. Department of Education, 2015) supporting this effort, evidence for the face validity of the rubric included experimental research, descriptive research, grey literature, professional

standards, and expert opinion. Further, the published citations list includes prominent researchers as well as studies conducted by credible organizations (U.S. Department of Education, 2015b). Because the creators of this scale did not provide statistical evidence of its validity and reliability, the researcher conducted a reliability analysis and calculated a Cronbach alpha coefficient of .873 using a statistical package (SPSS 24.0). The researcher also confirmed the reliability of the two instrument sub-scales: *emphasis placed on specific knowledge economy skills* (.871) and *agreement with statements pertaining to knowledge economy skills* (.845).

### **Qualitative Data**

**Perceptions of Organizational Structures.** Analysis of open-response questions from the online survey regarding structures and supports required by teachers to support more innovative classroom practice provided qualitative information to better explain the quantitative data captured by the ENTRELEAD (Renko et al., 2013) and PLCA-R (Olivier et al., 2009) instruments. This analysis resulted in the development of new conceptions about the organizational structures based on the anticipated and unanticipated perceptions of the study participants (Nastasi & Schensul, 2005). As described by Nastasi and Schensul (2005), the triangulation of responses with the quantitative data and the maintenance of a reflexive journal support the trustworthiness of this analysis.

**Vision for Innovation.** Vision to describe innovation of classroom practice to prepare students for the knowledge economy implies more than discussion of access to technology and instead requires the use of pedagogy as a construct (Li & Choi, 2013). Through an open-response question on the survey, participants described their vision for

innovation of classroom practice. The researcher then used the individual district technology or strategic plans to triangulate the responses for consistency as well as emphasis on innovation of instruction rather than simply access to devices or tools. To establish trustworthiness, the researcher developed the codes for analyzing the qualitative data from available literature (Levy & Murnane, 2013; Soulé & Warrick, 2015) and maintained a reflexive journal to document the thinking behind those codes (Nastasi & Schensul, 2005).

**Trustworthiness.** According to the literature presented in the previous chapter, drivers of this problem of practice could be the traditionally bureaucratic organizational culture of schools (Honig, 2006a; Mehta, 2013a) as well as the influence of technology on traditional systems and structures (Collins & Halverson, 2010). The researcher worried that these concepts from the literature may bias the coding of qualitative data. To mitigate that bias and ensure trustworthiness, the researcher used a reflective journal to document the thought process behind all coding and triangulated the qualitative data with multiple sources (Nastasi & Schensul, 2005). This process helped the researcher to mitigate bias and adjust the coding process accordingly.

Because of this self-reflection, the coding process became more iterative. After the initial rounds, the researcher returned to either the literature associated with related quantitative scales or the published technology plans to create new codes on which to conduct the analysis. Saldana (2009) advocates for multiple cycles of coding until saturation. Further, the researcher referenced the quantitative data during the analysis of the qualitative to look for trends and comparisons as well as for triangulation (Nastasi & Schensul, 2005). By using multiple sources to inform the coding of the qualitative data

and maintaining the reflective journal, the researcher attempted to mitigate personal bias and establish trustworthiness through a rigorous approach that included sincerity, transparency, and self-reflexivity (Tracy, 2010).

### **Data Collection**

This needs assessment employed a sequential, explanatory mixed-methods design (Creswell & Plano Clark, 2011). Following the guidelines from Creswell and Plano Clark (2011), first the researcher designed and implemented the quantitative strand. To capture quantitative data, the researcher designed a survey using an online platform (Qualtrics) and disseminated it via a hyperlink within an introductory email sent through each district's central office administration. To encourage a greater response rate, the researcher also sent a follow-up email before closing the survey (see Appendix A for sample letters). After completing an initial analysis of the quantitative data, the researcher identified results that required further clarification from the qualitative data (Creswell & Plano Clark, 2011) and then conducted an analysis of the open-response questions from the survey as well as the districts' published technology or strategic plans.

The online questionnaire served as the primary instrument for this study, and all collected data has been maintained in password protected accounts. The survey instrument (see Appendix B for schedule of questions) included four distinct sections: general demographic information, perceptions about knowledge economy skills, qualitative questions asking for participants to identify necessary structures to support innovation and to describe their vision for innovation, as well as quantitative items to assess perceptions of the district as a learning community. The survey questionnaire contained a combination of closed-choice and open-response questions. Closed-choice



questions presented mutually exclusive response options. Open-ended questions gathered qualitative data. All participants received the same schedule of questions with one exception. Once participants had identified themselves as either central office or building-level leaders, they received qualitative questions about the necessary structures to support innovation phrased to match their position within the district. The researcher also collected and analyzed the technology or strategic plans published by the districts on their publicly available websites.

### **Data Analysis**

This empirical study employed a variation of an explanatory sequential design where the qualitative analysis provided additional explanation of the initial quantitative strand (Creswell & Plano Clark, 2011). To respond to the research questions, the researcher first created an online survey to gather both quantitative and qualitative data. Next, the researcher obtained permission to conduct the study within the districts and disseminated the survey instrument. The survey instrument included an informed consent form for each participant. Though a traditional explanatory sequential design would implement the quantitative strand and then use those results to inform the qualitative, the researcher used a convergent parallel approach to collect both types of data from the survey (Creswell & Plano Clark, 2011). However, the researcher used the results of the quantitative analysis to design and implement a second qualitative strand to analyze the open-ended responses from the survey as well as the published technology or strategic plans for each district. This strategy of using the qualitative data to offer a follow-up explanation to the quantitative analysis commonly occurs with explanatory designs (Creswell & Plano Clark, 2011). Within this mixed methods study, the quantitative

strand informed the design and analysis of the qualitative though the mixing of the two data sets only occurred during analysis.

To analyze the quantitative data, the researcher followed the quantitative data analysis cycle recommended by Lochmiller and Lester (2017): prepare the data for analysis, become familiar with the data, calculate descriptive statistics, and conduct inferential analysis. After collecting the survey responses, the researcher exported the data from Qualtrics and imported it into Excel. Then, the researcher discarded incomplete responses and recoded others to prepare the data for analysis. For example, when asked to identify their district in an open-response field, some participants indicated *Bridge, South* (pseudonym) while others entered *Bridgetown*. The researcher coded these as *Bridgetown, South* to group the responses accordingly. Additionally, the Likert-scale questions all exported as text responses rather than numbers. Using the associated scale for the survey items, the researcher re-coded these numerically so that they could be analyzed statistically. After becoming familiar with the data, the researcher used both descriptive and inferential statistics as described in the next section.

**Quantitative Analysis.** After the data had been prepared, quantitative analysis began by employing descriptive statistics (Lochmiller & Lester, 2017). The researcher began by calculating the mean scores for each of the closed-response questions. According to Schutt (2015), examining measures of central tendency is often the first step in data analysis. Membership of participants in each district as well as their status of holding either a central office or building level position served as the independent variables. All analysis compared the mean scores of these subgroups. Employing the analysis tools available from within Qualtrics, the researcher then examined the

percentages of the different responses to each survey item by subgroup before importing the data from Excel into a statistical package (SPSS 24.0). Each data set was examined for homogeneity and normality before using inferential statistics to determine whether any differences in mean scores might be statistically significant (Salkind, 2014).

The researcher also created new variables by combining the items from the individual sub-scales per the recommendations in the literature. These new variables included *emphasis placed on specific knowledge economy skills* and *agreement with statements pertaining to knowledge economy skills* from the *21st Century Skills/Deeper Learning* element of the *Curriculum, Instruction, and Assessment* sub scale of the Future Ready Dashboard (Alliance for Education, 2015a) as well as the ENTRELEAD instrument (Renko et al., 2013) and the *Shared Values and Vision* sub-scale of the PLCA-R instrument (Olivier et al., 2009). Before calculating inferential statistics, the researcher examined the distributions of the scores to check for normality. If the data did not violate the assumptions of the test statistic, then the researcher used independent t-tests to compare the mean scores between the central office and building level stakeholders within each district and a single-factor ANOVA followed by a post-hoc Tukey test to examine the differences in scores between districts (Salkind, 2014). For data that violated the assumptions of normality based on calculations of skewness and kurtosis, the researcher ran nonparametric tests to look for any significant differences (Salkind, 2014).

**Qualitative Analysis.** The qualitative analysis provided additional data to further explain the quantitative strand. Using multiple data sources, the researcher attempted to converge findings, mitigate personal bias, and establish trustworthiness by employing a rigorous approach during analysis (Tracy, 2010). Following the recommendation of

Saldana (2009), the researcher engaged in multiple coding cycles of coding until reaching saturation.

For the open-response survey items pertaining to the perceived structures and supports for innovation, the researcher reviewed all data from the open-response questions and then applied 1–2 descriptive codes based on keywords that appeared within the responses during the first cycle. She maintained a reflective journal to document the rationale behind each code and wrote analytic memos about the coding process to ensure trustworthiness (Lochmiller & Lester, 2017). In a second cycle of coding, the researcher re-coded the data based on a priori codes (Saldana, 2009) created from the survey items of the PLCA-R (Olivier et al., 2009) and ENTRELEAD (Renko et al., 2013) surveys. The researcher then quantitized the qualitative by counting the codes and calculating their percentages within the district sub-samples (Teddlie & Tashakkori, 2003). Finally, the researcher extracted supporting statements made by respondents to provide rich descriptions (Tracy, 2010).

To analyze the vision statements, the researcher repeated the cyclical process defined by Saldana (2009). First, she coded the open-response statements provided by respondents using descriptive codes that emerged from the data. Upon reaching saturation, codes were organized into themes (Saldana, 2009). With the published technology or strategic plans, the researcher repeated this process to identify key concepts such as *personalized learning*, *blended learning*, and *21<sup>st</sup> century skills*; essential questions like *what do we want students to know and be able to do?*; as well as the stated influence of any outside organizations like the Partnership for 21<sup>st</sup> Century

Skills or Future Ready Schools. Finally, the researcher compared the vision statements provided in the survey to the published content in the strategic or technology plans.

## **Summary of Results**

### **Perceptions of Professional Learning**

To address the research question of how central office and building stakeholders perceive that they currently communicate and collaborate to support teacher innovation of classroom practice, the researcher sought to understand how each district regarded itself to be functioning as both a professional learning community as well as an entrepreneurial organization. Select questions from the PLCA-R (Olivier et al., 2009) and ENTRELEAD (Renko et al., 2013) surveys quantitatively examined this construct. Qualitative analysis of open-ended survey questions then offered further explanation of the quantitative results.

According to Olivier et al. (2009), descriptive statistics prove to be useful in interpreting the results of this survey instrument. The authors assert that across the entire instrument, mean scores on a 4-point Likert-scale should fall between a high of 3.27 often associated with items in the *Collective Learning and Application* section and a low of 2.74 within the *Shared Personal Practice* sub-scale (Olivier et al., 2009). Since participants in this study responded to items from the *Shared Values and Vision* section of questionnaire, the researcher expected mean scores from this study to fall within the identified range (see Table 4). While this mostly proved to be true, in comparing the central office and building level educators as well as the individual districts, notable differences emerged with three of the survey items.

Table 4

*Mean Scores on PLCA-R Survey Items from 4-point Likert-scale*

Survey Item	Mean Score
A collaborative process exists for developing shared values among staff.	
Total Sample	2.96
Central Office	2.75
Building Stakeholders	3.00
Bridgetown	2.95
Bayview	2.43
Eastside	2.86
Hilltop	3.20
Shared values support norms of behavior that guide decisions about teaching and learning.	
Total Sample	2.963
Central Office	2.75
Building Stakeholders	3.00
Bridgetown	2.95
Bayview	2.43
Eastside	2.86
Hilltop	3.20
Staff members work together to seek knowledge, skills and strategies and apply this new learning to their work.	
Total Sample	3.13
Central Office	3.23
Building Stakeholders	2.97
Bridgetown	2.86
Bayview	3.00
Eastside	2.88
Hilltop	3.50
Decisions are made in alignment with the school's values and vision.	
Total Sample	2.90
Central Office	3.31
Building Stakeholders	3.06
Bridgetown	2.86
Bayview	3.57
Eastside	2.88
Hilltop	3.50
A collaborative process exists for developing a shared vision among staff.	
Total Sample	3.10
Central Office	2.92

Building Stakeholders	2.89
Bridgetown	2.67
Bayview	3.14
Eastside	3.13
Hilltop	3.00
School goals focus on student learning beyond test scores and grades.	
Total Sample	2.94
Central Office	3.23
Building Stakeholders	3.06
Bridgetown	2.81
Bayview	3.57
Eastside	3.13
Hilltop	3.33
Policies and programs are aligned to the school's vision.	
Total Sample	2.90
Central Office	2.85
Building Stakeholders	2.97
Bridgetown	2.90
Bayview	3.00
Eastside	2.63
Hilltop	3.17
Stakeholders are actively involved in creating high expectations that serve to increase student achievement.	
Total Sample	2.94
Central Office	2.85
Building Stakeholders	2.91
Bridgetown	2.71
Bayview	3.00
Eastside	2.88
Hilltop	3.17
Data are used to prioritize actions to reach a shared vision.	
Total Sample	2.94
Central Office	2.85
Building Stakeholders	2.97
Bridgetown	2.90
Bayview	3.29
Eastside	2.75
Hilltop	2.92

When asked whether staff members work together to seek knowledge, skills and strategies and apply this new learning to their work (Olivier et al., 2009) central office administrators reported a mean score of 3.23 out of 4.0 as compared to building

stakeholders at 2.97. An independent t-test revealed that there was not a statistical difference between central office ( $M = 3.23$ ) and building respondents ( $M = 2.97$ ,  $t = .10$ ,  $p < .05$ ). However, because the mean score from the Hilltop district ( $M = 3.5$ ) fell above the suggested high score of 3.27 (Olivier et al., 2009), the researcher conducted a single factor ANOVA to examine the differences between the scores from the four districts. This analysis revealed a significant difference between the district means ( $p = .012$ ). Further the Tukey post-hoc test revealed statistical differences between Bridgetown and Hilltop ( $p = .009$ ). Prior to the analysis, the researcher examined the data for normality and homogeneity of variance across the groups. The results indicated a skewness of 1.45 ( $SE = 0.62$ ) — a value outside of the acceptable limits — and a Kurtosis of 0.10 ( $SE = 1.19$ ). It can then be implied that while most respondents agree with the provided statement, significant differences presented themselves between the districts.

A different pattern emerged when participants responded to the statement that decisions are made in alignment with the school's values and vision (Olivier et al., 2009). Though the central office mean score of 3.31 on the 4-point Likert-scale surpassed the suggested high score of 3.27 (Olivier et al., 2009), the building mean of 3.06 fell within range, and a t-test ( $t = 0.02$ ,  $p < 0.05$ ) indicated a significant difference between these scores. At the district level, both the Hilltop ( $M = 3.50$ ) and Bayview ( $M = 3.57$ ) mean scores surpassed the suggested high score by Olivier et al. (2009). A single factor ANOVA ( $p = 0.001$ ) showed significant variation between the district scores, and the Tukey post-hoc test revealed significant differences between Bridgetown and Bayview ( $p = .017$ ) as well as Bridgetown and Hilltop ( $p = .008$ ). When the researcher examined the data for normality and homogeneity, the results indicated an acceptable skewness of 0.95



( $SE = .616$ ) but an unacceptable kurtosis of  $-1.34$  ( $SE = 1.19$ ). Based on this analysis of the data, it can be inferred that Bayview and Hilltop perceived that they had a stronger tendency to make decisions in alignment with their school's values and vision, particularly when compared with Bridgetown.

Finally, differences presented themselves on the survey item that asked for respondents to indicate their level of agreement with the statement that school goals focus on student learning beyond test scores and grades (Olivier et al., 2009). Again, central office administrators showed greater agreement with a mean score of 3.23 (out of 4.0) as compared to building level educators ( $M = 3.06$ ), but a t-test score ( $t = 0.07$ ,  $p < 0.5$ ) indicated that this could not be considered significant. However, the mean scores from both Hilltop ( $M = 3.33$ ) and Bayview ( $M = 3.57$ ) exceeded the high scores from Olivier et al. (2009) prompting a single factor ANOVA to compare all four districts. The single factor ANOVA ( $p = 0.02$ ) indicated that a significant difference did exist; and a post-hoc Tukey test showed that significant differences existed once again between Bridgetown and Bayview ( $p = .032$ ) as well as Bridgetown and Hilltop ( $p = .099$ ). However, it should be noted that when the researcher analyzed the data for normality and homogeneity, a skewness value of  $1.45$  ( $SE = .616$ ) fell outside of the acceptable limit though the kurtosis value of  $0.10$  ( $SE = 1.19$ ) could be considered acceptable.

To examine the overall construct of professional learning, the researcher then used a statistical package (SPSS 24.0) to create a new variable by combining the items from the *Shared Values and Vision* sub-scale of the PLCA-R instrument (Olivier et al., 2009). After examining the overall data set for normality and homogeneity — both skewness ( $-0.18$ ,  $SE = 0.39$ ) and kurtosis ( $0.11$ ,  $SE = 0.77$ ) values fell within the acceptable range —

the researcher conducted independent t-tests to look for significant differences between central office and building stakeholders as well as a single factor ANOVA to examine differences between districts. Though these tests did not prove to be statistically significant, the data indicated that both the central office administrators and the two districts from North state (Bayview and Hilltop) perceived that their districts operated more as professional learning communities.

### **Perceptions about Entrepreneurial Orientation**

In addition to examining the degree to which participants perceived that their districts functioned as a professional learning community, the researcher also sought to understand the entrepreneurial orientation of each district. A district with a strong entrepreneurial orientation possesses an adaptive organizational structure, a strong culture of innovation, and the presence of entrepreneurial leaders (Brettel et al., 2015) who encourage followers to pursue more innovative behaviors, articulate a clear vision, and encourage creativity (Renko et al., 2013). According to Renko et al. (2013), entrepreneurial leadership may exist as a pre-requisite for an entrepreneurial organization. For this reason, the researcher employed the ENTRELEAD scale to ask individuals to rate their direct supervisor's "entrepreneurial leadership qualities" (Renko et al., 2013, p.61). Much like with the PLCA-R scale (Olivier et al., 2009), analysis of the responses to these survey items revealed varying perceptions between central office and building stakeholders as well as variations across the districts.

The mean scores from central office administrators on a 7-point Likert-scale exceeded those of building level educators on seven of the eight survey items, and four of those scores proved to be statistically significant (see Table 5). These results intimate

that there may be differences of perception about the leadership support for innovation. Only when asked whether their immediate supervisor *challenged and pushed them to act in a more innovative way* did building level educators express greater agreement ( $M = 5.87$ ) than central office administrators ( $M = 5.77$ ) though this difference did not prove to be statistically significant as determined by an independent t-test ( $t = 0.59, p < .05$ ). However, it should be noted that when the researcher analyzed this data for normality and homogeneity, the results indicated minimal skewness and a platykurtic distribution for all but one measure. Only the data from the item of *takes risks* demonstrated a normal distribution with a skewness of -0.48 ( $SE = 0.64$ ) and kurtosis of -0.87 ( $SE = 1.23$ ) within the central office sub-sample.

Table 5

*Central Office vs Building Level Responses on the 7-point ENTRELEAD Scale*

	Central Office Mean Score	Building Level Mean Score	T-Value
Takes risks	6.25	5.51	0.010*
Has creative solutions to problems	6.08	5.21	0.007*
Demonstrates passion for his/her work	6.69	5.79	0.012**
Has a vision of the future of our school or district	6.54	5.84	0.035**

Note: \* $p < .01$ , \*\*  $p < .05$

Despite the lack of a normal distribution, the researcher also used a single-factor ANOVA to compare the mean scores between the districts on the survey items. The only significant difference existed between the districts on the item that asked whether *immediate supervisors possessed creative solutions to problems* ( $p = 0.049$ ), but a post-

hoc Tukey test did not show any significant differences between the districts. Across all survey items, Bayview and Hilltop from North state had higher mean scores than Bridgetown and Eastside from the South state, indicating that they may possess more entrepreneurial leadership within their organizations. However, it should be noted that the North districts also had a higher percentage of central office administrators in their samples than the South districts which may have affected the results.

To examine the overall construct of entrepreneurial leadership, the researcher then used a statistical package (SPSS 24.0) to calculate a new variable by combining the items from the ENTRELEAD instrument (Renko et al., 2013). First, the researcher examined the data for normality and homogeneity. Both skewness (-1.31,  $SE = 0.34$ ) and kurtosis (3.10,  $SE = 0.67$ ) fell outside of the acceptable ranges and indicated that a normal distribution of data did not exist. Since the data violated the assumptions of normality required by a single factor ANOVA (Salkind, 2014), the researcher conducted a nonparametric test to analyze the data. A Kruskal-Wallis test (0.26,  $p < .05$ ) confirmed that significant differences did not exist across the four districts despite discrepancies on individual survey items. Therefore, it can be assumed that a similar amount of entrepreneurial leadership may be present in each district.

### **Perceptions of Organizational Structures - Qualitative Findings**

Though the quantitative data from the PLCA-R (Olivier et al., 2009) and ENTRELEAD (Renko et al., 2013) scales revealed few statistically significant differences about how central office and building stakeholders perceived that they communicated and collaborated to support teacher innovation of classroom practice, the qualitative data captured from open-response survey items provided additional insights.

Depending on whether participants identified themselves as a central office or building stakeholder, they responded to open-response questions specific to their position. Central office administrators responded to *what do you believe that principals/assistant principals/coaches/ teacher-leaders need in order to better support their teachers as they innovate their classroom practice with technology?* Building stakeholders replied to *what do you believe that you need from central office leadership to support your teachers' innovation of classroom practice with technology?* These questions intended to elucidate the perceived structures required by teachers to support innovation of classroom practice.

**Coding Process.** In attempt to mitigate researcher bias and ensure the trustworthiness of the qualitative data, the researcher used the following process to analyze the open-response questions per the recommendations from Saldana (2009). First, the researcher read each item, highlighted salient points, and created descriptive codes based on keywords that described the responses. Because the researcher felt that bias may have entered the coding process, before conducting a second review of the data, a codebook (see Appendix C) was created based on the items from the ENTRELEAD (Renko et al., 2013) survey and the *Shared Values and Vision* sub-scale of the PLCA-R instrument (Olivier et al., 2009). In creating this new code book, the researcher hoped to improve the trustworthiness of the analysis through transparency and sincerity (Tracy, 2010).

During the second cycle of coding, the researcher applied these new codes to the responses. For example, the response of “These members of the organization need formal opportunities to share best practices and the freedom to take risks in their work as

they move towards more personalized differentiation for all students” (Eastside Superintendent, personal communication, November 14, 2016), received the codes *community* and *risk* on the first round of coding but *takes risks* and *works together* (short hand for *staff members work together to seek knowledge, skills, and strategies and apply this new learning to their work*) on the second round. As another example, “I need opportunities for training and collaborative planning, as well as opportunities to visit model schools/districts” (Hilltop Instructional Coach, personal communication, October 17, 2016) was coded as *training* and *time* during the first round but *Policy & Programs* (short hand for *policies and programs are aligned to the school’s vision*) on the second. To ensure the trustworthiness of the analysis as well as to document the thinking behind the codes, the researcher maintained a reflective journal throughout the coding process to explain the rationale for the application of each code (Nastasi & Schensul, 2005). After the second round of analysis, the researcher quantitized the codes (Teddlie & Yu, 2007) and compared central office to building stakeholders to examine any differences in perception between the layers within the districts.

**Central Office Administrator Responses.** When asked about the requirements to better support teachers as they innovate their classroom practice with technology, 46% of central office administrators indicated a need to *take more risks* and 23% indicated a need to *seek out creative solutions*, to *challenge and push educators to act in a more innovative way*, as well as to *foster a vision for the future* — all tenets associated with entrepreneurial organizations (Renko et al., 2013). Since the quantitative data from the ENTRELEAD instrument (Renko et al., 2013) indicated that a majority of central office administrators either agreed or strongly agreed with these survey items, it can be inferred

that they acknowledge the existence of entrepreneurial leadership in their direct supervisors and feel as though the presence of this trait may support innovation throughout the district. As described by the Assistant Superintendent in Hilltop,

Educators need to know where we are headed and why we are headed there, the message needs to be cohesive and reinforced in a variety of ways...Much of this work entails rethinking what school looks like. This vision will only be developed through trial and error. Somethings will work, somethings will be a "not yet" or a total failure. We will not make progress if our faculty does not feel that their experimentation and iterations are supported and valued. (personal communication, November 10, 2016).

Though analysis of the PLCA-R (Olivier et al., 2009) showed that 85% of central office administrators either strongly agree or agree that *stakeholders are actively involved in creating high expectations that serve to increase student achievement*, 23% of central office respondents described the need for more stakeholder involvement. Similarly, though 77% of these respondents either agree or strongly agree that *policies and programs are aligned to the school's vision*, 23% of the provided statements describe the necessity for policies and programs to support innovation. The Director of Educational Technology in Bridgetown explained,

The biggest challenge is finding time to work with the educators in a meaningful way that provides embedded supports before/during/after instructional cycles.

There also needs to be a systemic approach/plan with coordinated support across the district. Just like we can't settle for pockets of excellence in the classroom, we

can have pockets of excellent support, leaving most of the staff out of the process (personal communication, October 21, 2016).

When asked why they felt as though their suggested supports would lead to systemic innovation, 54% of central office administrator statements inferred that educators require *shared values to support norms of behavior that guide decisions about teaching and learning*. However, according to the PLCA-R (Olivier et al., 2009), 100% of central office administrators agreed or strongly agreed that this component of professional learning communities already existed within their districts. Further, 46% of the open-responses intimated that building level educators require a *collaborative process for developing shared vision*. This contrasts with the quantitative data from the PLCA-R which indicated that 85% of central office leaders agreed or strongly agreed that these processes already exist.

Though not a component of either the PLCA-R or ENTRELEAD instruments, 46% of the statements from central office administrators also included a reference to the need to increase teacher comfort with technology. “How can people lead or implement anything without having the knowledge or be comfortable with it themselves first?” asked the Educational Technology Director in Bayview (personal communication, October 19, 2016). According to some published studies, teacher comfort with technology can be associated with increased usage (Dornisch, 2013; Ertmer et al., 2012; Orlando & Attard, 2015), and yet other studies assert that pedagogical beliefs by the teachers or the leadership plays a more central role in innovation (Mishra & Koehler, 2006; Opfer, Pedder, & Lavicza, 2011; Overbay et al., 2010).



**Building-Level Stakeholder Responses.** The statements from the building-level educators contrasted with those from central office administrators. When asked what they required from central office leadership to better support their teachers' innovation of classroom practice with technology, 52% responded by describing the need for more *policies and programs aligned to the school's vision for innovation* (Olivier et al., 2009). However, 85% of the building stakeholders responded on the PLCA-R survey that they either strongly agree or agree that these policies already exist. As described by a middle school teacher from Bridgetown, "I would love to have some guidelines for the expectations for implementation of technology. There is so much out there. It is very overwhelming... What is the expectation?" (personal communication, October 19, 2016). Though not a component of either survey instrument, 39% reported requiring increased or more updated access to technology infrastructure and devices, and 20% stated that teachers needed increased training and time to use technology more effectively. An assistant principal in Hilltop stated that the teachers in her building required,

Time and opportunities for professional development that are focused on the expected outcome(s) and are offered over the course of 2-3 years. Different 'levels' of offerings to acknowledge the different entry points of staff members. Graduate level course work offered outside of school year/ school day. Sustained focus on in-school PD time on meeting the expectations, with the understanding that this takes precedent over other initiatives. Clearly written expectations with time deadlines and support (teacher leaders as contact person) to meet (personal communication, October 17, 2016).

A follow-up question asked respondents to explain why they felt as though these supports would lead to increased innovation with technology. Unlike with the initial question, only 27% of responses referenced policies and programs; however, 30% described the need to develop *shared values to support norms of behavior that guide decisions about teaching and learning* (Olivier et al., 2009). Of note, 88% of these stakeholders either strongly agreed or agreed that these values already existed when responding to the PLCA-R survey items. “Teachers are willing to try new things, but the culture has to be one in which they feel safe in an environment conducive to their learning (not unlike our students),” (Bridgetown Principal, personal communication, November 3, 2016). A principal in Eastside further explained,

If we are leading from the top and modeling (not top-down), the faculty and staff will follow suit. The resisters need to see it in action. We need to promote and showcase faculty in the district who are already talking the talk and walking the walk (personal communication, October 15, 2016).

Twenty-five percent of building level respondents continued to report that lack of access to technology, tools, and infrastructure thwarted their ability to innovate, and 14% referenced a need for additional training or professional development. “Without training, we're learning on the fly which is very frustrating, time consuming, and not always productive learning for the students” (Bridgetown Elementary Instructional Coach, personal communication, October 20, 2016). A coach from Hilltop offered further insights:

I think that teachers have exciting ideas but don't always know the best technological avenues to make ideas happen. We get bogged down with the day

to day tasks/work and the technology is sometimes seen as something extra to organize. With more PD around innovative practices I think more teachers would see that they can take the standards and present them differently using innovative practices rather than technology being one more thing (personal communication, October 17, 2016).

As argued in the previous chapter, to implement systemic innovation across the micro and mesosystems within district organizations requires central office and building leaders to function as an organizational learning community dedicated to building collective knowledge and adapting to change (Senge & Kim, 2013). Though the quantitative analysis of the PLCA-R (Olivier et al., 2009) and ENTRELEAD (Renko et al., 2013) instruments intimated that the four districts in question do possess many positive attributes of learning communities, the qualitative data paints a different picture. The data from the open response questions reveals a disconnect between the emphasis on risk taking and innovation in the central office and the desire for policies, programs, technology, and time at the building level. These trends persisted across all four districts, indicating that a lack of entrepreneurial leadership and professional learning may continue to impact the spread of innovation.

### **Perceptions about Innovation of Classroom Practice**

At the outset of this study, the researcher hypothesized that central office and building stakeholders may possess different perceptions and visions of innovative classroom practice to foster students' knowledge economy skills. The final research question sought to understand how these districts describe innovation in the classroom. To ascertain participant perceptions of the emphasis placed on specific knowledge

economy skills within the districts, as well as to look for consistency in the language used to describe specific practices, the researcher conducted a quantitative analysis of responses to the *21st Century Skills/Deeper Learning* element of the *Curriculum, Instruction, and Assessment* sub scale of the Future Ready Dashboard (Alliance for Education, 2015a). The researcher then completed a qualitative analysis of both the open response survey items that asked participants to describe their vision for innovative classroom practice with technology as well as the districts' published technology or strategic plans.

**Perceptions of current innovative practices.** In responding to statements taken from the *21st Century Skills/Deeper Learning* element of the *Curriculum, Instruction, and Assessment* sub scale of the Future Ready Dashboard (Alliance for Education, 2015a), participants indicated their perceptions about current practices with technology to foster students' knowledge economy skills. Descriptive and inferential statistics revealed little differences in the mean scores. However, levels of agreement and emphasis within the districts as well as between central office and building participants varied considerably.

**Central vs. Building Differences.** Though a statistical difference did not exist between mean scores of the central office and building level participants as determined by independent t-tests, the data indicated that these groups held different perceptions. When asked whether the district had established knowledge economy skills (i.e., problem solving in novel situations, communication and collaborating using the appropriate technology, analyzing and synthesizing information (Levy & Murnane, 2013)) as learning standards for all students, 46% of central office administrators agreed as compared to

56% of building level educators who either strongly agreed or agreed. Similarly, when asked whether the district had clearly communicated its expectations to integrate these skills into the curriculum, 46% of central office administrators agreed but 56% of building level educators strongly agreed or agreed. On the other hand, regarding whether teachers had been provided the resources and support needed to redesign classrooms into innovative learning environments, 53% of central office administrators strongly agreed or agreed though only 38% of building level educators expressed the same level of agreement.

When asked to rate their perceptions of the level of emphasis placed on specific skills based on a 4-point scale ranging from *no emphasis* to *strong emphasis*, central office and building stakeholders also held different perceptions. In most instances, central office administrators perceived a greater emphasis than the leaders in the building with the exception of *communication with appropriate technologies* (Alliance for Education, 2015a). Table 6 below illustrates that central office and building leaders perceived that a strong emphasis had been placed on the skills of critical thinking, creativity, collaboration, and communication. The Partnership for 21<sup>st</sup> Century Skills identifies these skills as the “4Cs” (Soulé & Warrick, 2015, p. 180). As will be described in the qualitative section, each district explicitly referenced these skills in their technology or strategic plans.

Table 6

*Strong Emphasis on Knowledge Economy Skills Based on a 4-point Scale*

Knowledge Economy Skill	Central Office	Building
Critical thinking and problem solving in novel situations	53.8%	40.35%

Creativity and Innovation	46.15%	29.82%
Collaboration with the appropriate technologies	76.92%	43.86%
Communication with the appropriate technologies	38.6%	40.35%

***District Comparison.*** Across most survey items in this section of the questionnaire, Bayview indicated the greatest level of agreement and strongest emphasis on knowledge economy skills, and Eastside possessed the lowest mean scores. It should be noted, though, that these two districts also had smaller sample sizes which could impact the interpretation of the data. Particularly with questions pertaining to whether the district had clearly established knowledge economy skills as a priority and communicated that intention to all stakeholders, much variation occurred between the district samples (Table 7).

Table 7

*Variation in Responses to Select Items from the 21st Century Skills/Deeper Learning element*

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
Our district has established Knowledge Economy Skills as learning standards for all students across all levels.					
Bridgetown, South		56%	24%	20%	
Bayview, North	28.57%	28.57%	28.57%		14.29%
Eastside, South		44.44%	22.22%	11.11%	22.22%
Hilltop, North	6.25%	56.25%	12.5%	25%	

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Our district has clearly communicated to all stakeholders its expectations that schools will integrate Knowledge Economy Skills into the learning of all students.					
Bridgetown, South	4.17%	54.17%	29.17%	12.5%	
Bayview, North	28.57%	28.57%	28.57%		14.29%
Eastside, South	11.11%	11.11%	55.56%	11.11%	11.11%
Hilltop, North	6.25%	37.5%	31.25%		

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In addition to differences between the districts, the data also showed differences between the two states. In the two North districts, responses trended towards stronger agreement especially when the survey items addressed perceptions of district support for the infusion of knowledge economy skills and innovation of classroom practice.

However, it should be repeated that the relatively small sample size in Bayview as well as the high concentration of central office administrators within that district sample may have impacted the data. Conversely, in Bridgetown and Eastside — both districts in the South state — respondents indicated more disagreement than agreement.

These trends continued when asked about the level of emphasis placed on specific knowledge economy skills, particularly those associated with the 4Cs of critical thinking, creativity, communication, and collaboration (Soulé & Warrick, 2015) as shown in Table 8. Though each of these districts claimed to make the infusion of knowledge economy skills and innovation with technology a priority, as will be discussed in the next section, this data implies that not all members perceived the same level of emphasis or agreement. Though this quantitative data did not show statistically significant differences between the sub-groups, it did illustrate that stakeholders do not share the same conception for current practices. For this reason, the researcher designed a qualitative strand to better understand this discrepancy.

Table 8

*Strong Emphasis on Knowledge Economy Skills*

	Bridgetown	Bayview	Eastside	Hilltop
Critical thinking and problem solving in novel situations	32%	57.14%	33.3%	50%
Creativity and Innovation	28%	42.86%	11.11%	37.5%
Collaboration with the appropriate technologies	44%	85.71%	22.22%	37.5%
Communication with the appropriate technologies	44%	57.14%	44.44%	25%

**Qualitative Analysis of Vision Statements.** A qualitative analysis followed the quantitative strand to further explain the differences in perceptions with regards to the participants' visions of innovative classroom practice to prepare students for the knowledge economy. The researcher reviewed the open response items from the survey, as well as the published technology or strategic plans from each district, and coded them for the following: common, emergent themes; key concepts such as *personalized learning*, *blended learning*, and *21<sup>st</sup> century skills*; essential questions like *what do we want students to know and be able to do?*; and the stated influence of any outside organizations like the Partnership for 21<sup>st</sup> Century Skills or Future Ready Schools. To triangulate the qualitative data, the vision statements provided in the survey were compared to the published technology and strategic plans as well as the quantitative data collected from the *21<sup>st</sup> Century Skills/Deeper Learning* element of the *Curriculum, Instruction, and Assessment* sub scale of the Future Ready Dashboard (Alliance for Education, 2015a).



Each of the four districts published some form of technology or strategic plan to their district web site, though little consistency existed. In Bridgetown, the district strategic plan for 2016-2021 described technology as a “tool for learning” (Bridgetown Regional School District, 2016a, p. 4) and included 21<sup>st</sup> century skills as a component of their college and career readiness goals. However, the district has also embraced the *Future Ready* initiative from the U.S. Department of Education’s Office of Educational Technology, and the superintendent cited “our future ready vision” (personal correspondence, October 21, 2016) as the district vision for innovation.

Bayview Public Schools published a 2016-2019 Technology Plan which emphasized that all students should have access to a personal device and that technology should be viewed as a given and not a supplemental material in the classroom. According to the district web site, Eastside Public Schools had a DRAFT 2015-16 Technology Plan that had yet to be approved by the school committee as well as a *Strategic Vision 2020*. In both documents, the Eastside technology mission stated that the district is “committed to providing the learning community with the skills, knowledge, competencies, habits of mind, and equitable access that are necessary to integrate technology in a 21<sup>st</sup> century teaching and learning environment” (Eastside Public Schools, 2015, p.4). In contrast to the other three districts, Hilltop Public Schools did not have a specific technology plan. Instead, the district published strategic priorities, goals, and recommendations for 2012-2016 and listed “enhancing learning through technology” (Hilltop Public Schools, 2012, p.2) as a primary initiative.

After reading each of the published plans, the researcher used the following process to analyze the contents of the documents. First, the researcher looked for an

explicit vision or mission statement that specifically addressed either technology, innovation, or the notion of 21<sup>st</sup> century or knowledge economy skills. Then, key terms, themes, and definitions from the documents were identified and coded based on their frequency in the text. Finally, the researcher looked for mention of any authority that may influence the design of the technology or strategic plans.

Bridgetown heavily referenced the *Future Ready* initiative as well as Common Sense Media — a nonprofit organization that provides resources related to digital literacy and citizenship. Eastside explicitly referred to the definitions and standards provided by the South state department of education, and Hilltop included references to the Partnership for 21<sup>st</sup> Century Skills as well as the work of Rachel Curtis and Elizabeth City from the Harvard Graduate School of Education. Though Bayview Public Schools did not overtly mention any other organizations or authorities, much of the language used in their technology plan resembled that found in the *Future Ready* documentation. The district also referenced other technology frameworks such as the Substitution Augmentation Modification Redefinition (SAMR) Model from Dr. Ruben Puentedura and the Technology Integration Matrix (TIM) from the Arizona K12 Center. Throughout the document analysis process, the researcher maintained a reflective journal to document thinking and help ensure trustworthiness (Nastasi & Schensul, 2005).

***Bridgetown Regional School District.*** According to the district's *Future Ready* web site, Bridgetown Regional School District provides all students with personalized learning environments that promote deeper, authentic learning experiences. The district claimed to advocate for a curriculum focused on student collaboration, creation, problem solving and student voice to help students develop the knowledge and skills necessary for

an increasingly digital world (Bridgetown Regional School District, 2016b). This statement closely paralleled the vision provided by the *Future Ready* framework (U.S. Department of Education, 2016), and key themes that emerged from examining the pages of the district web site included personalized learning, blended learning, deeper learning, citizenship, and the 21<sup>st</sup> century skills of communication, collaboration, creativity and critical thinking (Soulé & Warrick, 2015). The *Future Ready* plan consists of seven categories presented as gears that include *curriculum, instruction and assessment; personalized professional learning; robust infrastructure; budget and resources; data and privacy; community partnership; and use of space and time* (Alliance for Education, 2015a). Though the web site stated the district vision associated with each of those gears, the primary focus appeared to be on technology infrastructure with several pages devoted to the district's 1:1 initiative (providing each student with access to a personal device) and adoption of the Google suite of productivity tools.

Despite the emphasis placed on the *Future Ready* initiative in published materials from the district, only the superintendent referenced it when asked to describe innovation of classroom practice. Additionally, though the published vision stated that all students will be provided with “personalized learning environments that promote deeper, authentic learning experiences” (Bridgetown Regional School District, 2016b), only 35% of respondents included *personalized learning* in their vision statements and 12% used a term that could imply *authentic learning*. For example, an assistant principal described her vision as, “Teachers have multiple tools to personalize, connect and accelerate student learning across content, enabling them to address relevant problems, pursue interests and intellectual curiosity that will support success in their daily lives” (personal

correspondence, October 20, 2016). The researcher coded that statement as *personalized learning* and *authentic learning*.

However, 47% of respondents described their vision as *using technology as a tool for learning*. While this does correspond to one of the priorities from the 2016-2021 strategic plan (Bridgetown Regional School District, 2016a), participants used different language to articulate this concept. Statements ranged from “I believe that technology is a great tool for learning, and it maximizes the learning capacity of all teachers and learners” (Middle School Teacher, personal correspondence, October 27, 2016), to “Technology has to have a purpose that makes its use better than using the old traditional resources” (Classroom Teacher, personal correspondence, October 27, 2016).

The quantitative analysis of the *21st Century Skills/Deeper Learning* element of the *Curriculum, Instruction, and Assessment* sub scale of the Future Ready Dashboard (Alliance for Education, 2015a) revealed that 32% of participants from Bridgetown perceived that the district placed a strong emphasis on critical thinking and problem solving; 28% indicated a strong emphasis on creativity and innovation; and 44% noted a strong emphasis on communication and collaboration. However, only 24% directly mentioned any of these skills or the concept of 21<sup>st</sup> century skills in their responses. In comparing the personal vision statements with the published district vision statement, the researcher created a code book consisting of the key terms and themes from the district *Future Ready* web site — 4Cs, 21<sup>st</sup> century skills, personalized learning, authentic learning, and deeper learning (Bridgetown Regional School District, 2016b) — and applied them to the open-response statements. Fifty-nine percent of the statements did not correspond to the published plans and included items such as, “Technology is a tool

for students to learn, moving thru the Blooms taxonomy” (Information Technology Director, personal communication, October 27, 2016), and, “Teachers should facilitate learning by instructing students on technology applications and then allowing them to utilize the technology to attain content learning standards” (Principal, personal communication, October 18, 2016).

***Bayview Public Schools.*** Compared to the other districts in this study, Bayview Public Schools has made the greatest investment in student technology access. All students in grades 1-12 have a district-issued iPad as well as access to other types of computers as part of their technology initiative (Bayview Public Schools, 2016). The depth of the district technology plan seemed to reflect this enormous investment in devices and included an extensive vision statement that described how technology should be considered a ubiquitous component of student learning and not a supplemental one. Citing the usability gap defined by the 2016 National Educational Technology Plan (U.S. Department of Education, 2016) as a catalyst for their curriculum, the district emphasized the role of students as active users of technology and not just passive consumers of content. Unlike the other districts, Bayview also discussed the role of Open Educational Resources (OER) and teacher-created, digital content. According to their technology plan, Bayview intends to have a fully digital curriculum by 2020. Of note, the technology plan stated that “In Bayview, it is clear that our biggest technology initiative isn’t a technology initiative at all. It is curriculum that must guide the use of technology tools in the classroom more than ever before” (Bayview Public Schools, 2016, p.8).

When defining student learning, the district described the need for shifting classroom structures away from traditional instruction and towards *project based, flipped,*

and *blended* learning (Bayview Public Schools, 2016). It also defined a set of information and digital literacy goals that included *critical thinking and problem solving*; *student choice and leadership*; *initiative and entrepreneurialism*; as well as *curiosity and imagination*. These goals and new learning structures formed the basis of the code book used to analyze the individual vision statements. As noted in the researcher's reflective journal, the district technology plan also delineated goals and objectives for the different grade levels and the educators. These goals, grouped into four areas, included digital citizenship, technology, information and media literacy, as well as love of reading (Bayview Public Schools, 2016).

Given the breadth and depth of the technology plan from the district, the researcher noted that a lack of consistency in statements between the respondents may not be surprising. Each respondent seemed to align to a different component of the plan. Though the Assistant Superintendent who helped to launch the 1:1 iPad program in 2011 wrote, "My vision is for staff to create learning environments where students are encouraged to choose the right tool at the right time to accomplish the task at hand" (personal correspondence, October 19, 2016), the Director of Technology described a desire for the district to move towards a model of mastery learning, and the Curriculum Director wrote about project based learning, research, as well as knowledge sharing. At the building-level, stakeholders in the district reinforced the concept of technology becoming a seamless component of the curriculum and discussed leveraging tools to support higher order thinking as well as critical problem solving skills.

These statements corroborated the findings from the quantitative analysis. When asked if the district had established knowledge economy skills as a learning standard for

students and then clearly communicated those standards to all stakeholders, 28.57% of respondents *strongly agreed* with both statements — a much greater percentage than the other districts. Bayview also had the greatest percentage of respondents who indicated that the district placed a strong emphasis on the knowledge economy skills associated with the 4Cs: critical thinking, creativity, communication, and collaboration (Soulé & Warrick, 2015). And yet, the researcher questions these results given the small number of respondents from the district as well as the high proportion of central office administrators within the sample. Additionally, the researcher noted that the central office administrators who participated in the online survey played an essential role in the evolution of the technology program in the district. Therefore, these responses may not be representative of the entire district.

***Eastside Public Schools.*** According to the published district materials, Eastside views technology as “a catalyst which transforms the curriculum, instruction and assessment cycle by using the wealth of resources, materials, experts, and data that is increasingly available” (Eastside Public Schools, 2015, p.9). Through access to digital tools, teachers should be able to create more *authentic* and *personalized* learning experiences for students, and the Technology Network Support System should allow all members of the district to accomplish this goal by providing and supporting a learning community with appropriate technology and professional development; advancing innovative technologies to enhance instruction, improve student achievement, support assessment, and expand efficiency; employing technology for communication and collaboration between and among staff, parents, students, the larger community, and the world (Eastside Public Schools, 2015).

Key concepts extracted from the technology plan thus included collaboration, communication, and innovation as well as personalized and authentic learning. The researcher used those terms to code the participant vision statements. Though the superintendent was the only central office administrator in the Eastside sample, when asked to provide his vision for innovation of classroom practice, he wrote, “I would like to see our classrooms transcend traditional time/space and bricks and mortar venues of learning to opportunities to construct and apply knowledge in innovative, creative ways across time and space” (personal correspondence, November 14, 2016). While it could be inferred that this statement corresponded to the technology vision as a representation of innovation, the description did not directly relate to any of the key terms identified in the code book and instead seemed to imply an emphasis on *blended learning* — using technology to support and enhance face-to-face learning through online content and instruction (Christensen, Horn, & Staker, 2013). After reviewing the statements provided by the rest of the district sample, 66% of respondents either explicitly stated that their vision included *blended learning* or described the concept in a manner similar to the superintendent. For example, the high school principal wrote, “That the technology and person to person, or person to group support is so ubiquitous and is implemented in such a way that what qualifies as a ‘classroom setting’ is radically redefined to be wherever the learners and the learning is occurring” (personal communication, November 8, 2016).

In contrast to the other district plans in this study, the Eastside technology plan placed substantially more emphasis on data analysis and technology tools than student learning. The researcher noted that despite the references to 21<sup>st</sup> century skills and student learning in the introduction, the strategic goals listed in the action items placed



more emphasis on data, student assessment, teacher professional development, and specific platforms. Of interest, although the district listed *collaboration with online tools to improve student achievement* as a primary strategic goal, the expected outcomes included *increased access to materials* and *less paper used* (Eastside Public Schools, 2015). The researcher found this incongruous and noted the discrepancy in her reflective journal. Further, the prominence of this strategic goal presented a contrast to the quantitative data collected in the previous section as only 22.2% of respondents indicated that the district placed a strong emphasis on collaboration.

The researcher also recorded that the district defined many of their other strategic goals in terms of specific technology tools such as “Students will begin to utilize Google as a communication and collaboration system” (Eastside Public Schools, 2015, p.23). To corroborate this finding, the researcher discovered that 50% of the personal vision statements focused on specific technologies rather than classroom practice or student learning. Participants consistently referred to the Google suite of tools, access to data systems, and specific devices.

This heavy emphasis on technology correlated to the reflective notes made by the researcher that the strategic plan placed more emphasis on specific tools rather than how students might use them in their learning. It may also explain the relatively low percentage of respondents (11.11%) who perceived that the district placed a strong emphasis on *creativity and innovation*. Nevertheless, it should be noted that only six members from Eastside completed the open response question asking for a vision statement which may make it difficult to generalize these remarks to the rest of the district.

**Hilltop Public Schools.** As previously mentioned, Hilltop published a set of strategic priorities that incorporated technology but not a specific technology plan. In the introduction, the district described its stated mission as to “provide students with the skills and knowledge for the 21st century... [so that students can succeed] in a world that is more complex than in any time in history” (Hilltop Public Schools, 2012, p.1). The plan identified *enhancing learning with technology* in a distinct section and then outlined specific goals within it: providing teachers and students with access to technology that would allow for new types of learning as well as the mastery of 21<sup>st</sup> century skills; access to information and learning opportunities; and opportunities for innovation (Hilltop Public Schools, 2012). Across all of the strategic priorities, Hilltop advocated for improving student learning, fostering global and cultural connections, as well as developing the 4Cs of 21<sup>st</sup> century skills: critical thinking, creativity, communication, and collaboration (Soulé & Warrick, 2015).

When reviewing the vision statements provided from the online survey, 50% of the respondents mentioned one of the 4Cs or the concept of 21<sup>st</sup> century skills. This corroborated the finding from the quantitative analysis asking participants to indicate the emphasis placed on specific knowledge economy skills. On the *Curriculum, Instruction, and Assessment* sub scale of the Future Ready Dashboard (Alliance for Education, 2015a), 50% of respondents indicated that the district strongly emphasized *critical thinking and problem solving* and 37.5% recorded a strong emphasis on *creativity and innovation* as well as *collaboration with the appropriate technologies*. As described by the Superintendent,

My vision is that of our district's: that innovation in the classroom can and should be enhanced through the use of technology, and that educators are empowered to determine ways in which technology can be used to provide learning experiences that would not otherwise be possible without it (e.g., the *Modification* and *Redefinition* levels of the SAMR model). Innovation with technology should be a means to achieve the goal of providing students with 21st century skills of critical thinking, collaboration, communication, and creativity (i.e., the 4 C's) (personal correspondence, November 15, 2016).

Fostering global and cultural awareness also emerged as a key term from the strategic plan, and quantitative analysis revealed that 62.5% of respondents indicated some level of emphasis on that skill — a much higher percentage than the other districts in the study; and yet, only 16.7% of the Hilltop participants mentioned this concept in their vision statement. For example, the Assistant Superintendent, an advocate within the district for global learning, wrote, “Students see themselves as empowered and able to make positive contributions to the to the world” (personal correspondence, November 10, 2016). Other themes that emerged from the vision statements included using new models of classroom instruction such as *project based* or *expeditionary* learning (25%) as well as more student-centered or personalized learning (16.7%). In 33.3% of the statements, participants referenced the various stages of Dr. Ruben Puentedura’s SAMR model to further explain how teachers and students might use technology in more innovative ways.

Technology will be used beyond the substitute and augmentation levels to strengthen students' skills in collaboration, communication and creativity as well as their understanding of content. The use of technology at this level will be

consistent among all teachers (Assistant Principal, personal correspondence, October 17, 2016).

During the analysis, the researcher coded the responses until reaching saturation and then triangulated findings with the quantitative data to mitigate personal bias (Nastasi & Schensul, 2005). Because the researcher had previously worked with the Assistant Superintendent and some of the instructional coordinators on innovative forms of instruction such as *global learning*, *project based learning*, and *design thinking* in her professional context, she worried that prior experience may influence the coding. By maintaining a reflective journal and reviewing her rationale for the application of codes, she attempted to ensure the trustworthiness of this analysis through transparency, sincerity, and self-reflexivity (Tracy, 2010).

### **Discussion**

At the outset of this study, the researcher hypothesized that the problem of practice lay in the organizational structures of the districts that influenced the social interactions between individuals and assumed that differences in perceptions existed between district and school-level leadership. In the previous chapter, the literature described the influence of nested chrono, macro, and exo systems (Bronfenbrenner, 1979) on the interactions between the networked micro and mesosystems (Neal & Neal, 2013) of district office and building leaders. Based on this theoretical framework and associated literature, the problem of practice appeared to lie between the hierarchical layers in the bureaucratic system of the districts. However, as discovered during the initial quantitative strand of this study, systemic innovation presents a complex phenomenon requiring an iterative approach to analysis (I. Newman et al., 2003).

Conducting the qualitative analysis to further explain the quantitative trends and relationships (Creswell & Plano Clark, 2011) revealed that while differences did exist between central office and building leaders, they had not manifested as expected by the researcher.

In exploring how central office and building leaders perceive that they currently communicate and collaborate to support instructional innovation of classroom practice, the researcher assumed that a traditional, bureaucratic structure (Honig, 2006; Mehta, 2013a) may be thwarting the districts' abilities to adapt and learn in a systemic way (Senge & Kim, 2013). The quantitative analysis of the PLCA-R (Olivier et al., 2009) and ENTRELEAD (Renko et al., 2013) scales seemingly indicated that these districts functioned more as learning communities and entrepreneurial organizations than initially assumed. Additionally, though significant differences presented themselves on some of the items within the instruments and sub-scales, the data did not show that the problem existed precisely between the central office and building levels of the organizations.

The qualitative analysis of the open response questions related to what stakeholders perceived as the necessary supports to help teachers innovate their classroom practice presented a different picture of the districts as organizations. Where central office administrators felt as though teachers needed to assume more entrepreneurial traits, building-level stakeholders described the need for more concrete programs and policies to guide implementation as well as clearer vision and direction from district leadership. This need for a clearly communicated vision further manifested itself in the analysis of the quantitative data from the *21st Century Skills/Deeper Learning* element of the *Curriculum, Instruction, and Assessment* sub scale of the Future

Ready Dashboard (Alliance for Education, 2015a) as well as the qualitative data gathered from open response questions and the published technology or strategic plans.

Though the researcher did not find any statistical differences between central office and building leaders either across the districts or within them, the data presented considerable variation in responses. The vision statements provided by the respondents further exemplified the variation within and across districts, particularly given the lack of correlation to their district's published plans. These observations led the researcher to the conclusion that systemic innovation may be stymied by the absence of shared language and effective communication rather than simply a lack of opportunity to communicate between the layers within the districts.

Instead of discovering that the problem existed within the formal, bureaucratic structures of the districts, the researcher recognized the need to address a different challenge. While central office and building leaders may engage in communication, they do so with different definitions, conceptions, and understandings of what "innovation" may look like in practice. To realize innovation across an entire system, Honig & Rainey (2015) argue that districts require tools to illustrate the larger system, foster communication, as well as help leaders shift from "reacting to co-creating the future" (p. 31). The next chapter will present literature to support the design of a set of digital resources intended to accomplish these goals and help districts to improve communication, develop shared language, and increase their capacity for organizational learning.

## **Limitations**

There are several limitations to this study. First, these results may not be generalizable to larger districts or those outside of the Northeast region of the U.S. Further, the small, suburban districts purposively chosen for this study already possessed a reputation for being innovative and had previously attempted to implement more innovative classroom practices to prepare students for the knowledge economy. Next, as noted throughout the study, the samples were not consistent across districts in size or characteristic. Though Bridgetown and Hilltop had sufficient numbers of participants as well as a proportion of central office and building stakeholders representative of their broader district leadership teams, both Bayview and Eastside had small and skewed samples. In Bayview, more central office administrators responded to the survey than building level stakeholders. This could have impacted both the results from within that district as well as the analysis across districts. Only the superintendent from Eastside responded to the survey from the central office, so those results may not be representative of the rest of the central office administration. Finally, the researcher's own personal bias may have influenced the analysis of the qualitative data. Though she used multiple sources to inform the coding of the qualitative data, maintained a reflective journal in attempts to mitigate personal bias, and attempted to establish trustworthiness through a rigorous approach that included sincerity, transparency, and self-reflexivity (Tracy, 2010), previous knowledge of the districts might have affected the analysis.

## Chapter 3

### **Digital Resources to Improve Communication and Organizational Learning**

Despite decades of attempts at education reform to prepare students for the knowledge economy (Fusarelli & Fusarelli, 2015; Mehta, 2013b), the American K-12 public school system has largely failed to keep pace with the ensuing intellectual and technological demands (Gordon, 2014). To prepare students for a labor market and society that values non-routine cognitive tasks such as "working with new information" and "solving unstructured problems" (Levy & Murnane, 2013, p.18), teachers need to adopt classroom practices that foster their students' critical thinking, creativity, and problem-solving skills (Soulé & Warrick, 2015) within a system that supports instructional innovation (Martinez et al., 2016).

According to a 2014 report by Fullan and Langworthy, given the ability for today's students to learn through digital technologies, formal institutions of education risk obsolescence in their current form. Schools need to adopt a new set of pedagogies — one that takes advantage of technology, encourages mastery of content, and involves both the creation as well as the consumption of new knowledge so that it can be applied to real-world contexts (Fullan & Langworthy, 2014). To achieve this type of learning, McLeod and Shareski (2018) advocate that schools need to embrace *Four Big Shifts*: deeper learning beyond factual recall; student agency achieved through differentiation, personalization, and universal access; learning experiences situated within real-world, authentic contexts; and technology infusion to scaffold the first three shifts as well as afford students with new opportunities for creative expression.



When schools begin to embrace these shifts, students wrestle with complex problems, develop a deep understanding of a domain of knowledge, apply their learning outside of the classroom, forge connections beyond individual lessons or tools, learn to navigate the challenges of collaboration, develop iterative thinking skills, and engage in empathy (Holland, 2018a; McLeod & Shareski, 2018). The *Worldwide Educating for the Futures Index* (Walton, 2017), a report written by the non-partisan Economist Intelligence Unit, supports this claim and asserts that those international systems poised to best prepare students for the future have embraced these ideals as part of their national policy. However, a problem of practice exists within the American public school system: district administrators and school leaders lack a shared language to clearly communicate a vision for instructional innovation to prepare students with these future skills such that the ideas diffuse throughout the social networks of the district's ecosystem (Rogers, 2004a). As a result of this communication failure, school and district leaders struggle to bring the education system into alignment to meet the disparate demands of the knowledge economy (Honig & Rainey, 2015).

This chapter presents the design of an intervention to that problem of practice. First, it reviews the data from the needs assessment in chapter two and clarifies the need for improved communication between district and school leaders to develop shared language. Then, it examines prior intervention studies and analyzes the tenets of those studies to build an argument for the design of a new intervention. Finally, using Senge's (1990; 2006) model of Organizational Learning Communities as a theoretical framework, it synthesizes the literature behind the development of an intervention program.

## **The Need for Communication and Common Language**

Using Bronfenbrenner's (1979) Ecological Systems Theory (EST) as a framework through which to examine the problem of practice, chapter one explained the impact of historical, social, economic, and cultural systems on the interactions between individuals within the networked micro and mesosystems (Neal & Neal, 2013) of American public school districts. Based on the review of the literature, the researcher hypothesized that the problem of practice lay in the organizational structures of the districts that influenced the interactions between individuals and assumed that differences in perceptions existed between district and school-level leaders. Because schools and districts exist as social systems that operate based on a set of institutionalized cultural norms (Willower, 1991), the researcher surmised that traditional, hierarchical structures prevented innovation of classroom practice. Adopting new instruction that leverages twenty-first century technologies and fosters students' knowledge economy skills directly conflict with the underlying organizational structure and culture of the public education system (Collins & Halverson, 2010). Students can now learn anywhere, anytime, and from any other person, undermining the culture of standardization and efficiency on which public education bases its identity (Collins & Halverson, 2010).

To investigate the problem of practice in context, the researcher conducted a mixed-methods, explanatory research study (Creswell & Plano Clark, 2011) in four small, suburban districts in the Northeastern region of the U.S. As described in chapter two, the study used quantitative measures to examine perceptions about professional learning, the entrepreneurial orientation of school and district leadership, as well as existing innovative practices. The researcher conducted a second, qualitative analysis of

open-response questions and published documents from each district to better understand participants' perceptions about existing organizational structures as well as the language used to describe innovation. After completing both analyses, the researcher determined that while school and district leaders may regularly engage in communication, they do so with different definitions, conceptions, and understandings of what "innovation" may look like in practice.

Quantitative data collected via the Professional Learning Community Assessment - Revised (PLCA-R) (Olivier et al., 2009) and ENTRELEAD (Renko et al., 2013) scales indicated that central office and building leaders perceived both the presence of a professional learning community and entrepreneurial, innovative leadership within their districts. However, responses varied considerably to survey questions from the *21st Century Skills/Deeper Learning element of the Curriculum, Instruction, and Assessment* gear of the *Future Ready Dashboard* (Alliance for Education, 2015a). When asked to rate the emphasis placed on policies to address specific knowledge economy skills such as critical thinking, creativity, communication, and collaboration, central office and building stakeholders held different perceptions. For example, 46% of central office administrators either *strongly agreed* or *agreed* that the district had established knowledge economy skills as learning standards for all students as compared to 56% of building level educators. Additionally, only 38% of building level leaders *agreed* or *strongly agreed* that they had the requisite resources to innovate classroom practice as compared to 53% of central office administrators.

These discrepancies contradicted the quantitative responses on the PLCA-R (Olivier et al., 2009) and ENTRELEAD (Renko et al., 2013) scales which indicated that

existing structures to support innovation of classroom practice already existed. Whereas 100% of central office administrators *agreed* or *strongly agreed* that educators in the district possess shared *values to support norms of behavior that guide decisions about teaching and learning* (Olivier et al., 2009), 54% of the open-response statements inferred that educators require additional clarification. Therefore, the researcher conducted a qualitative analysis of open-response questions that asked participants to describe the requisite structures to support innovation.

Qualitative analysis of open-response questions asking participants to state what they perceived to be the shared vision for innovation of classroom practice also uncovered discrepancies within the districts despite the use of some common terminology. Though participants cited concepts such as Dr. Ruben Puentedura's Substitution Augmentation Modification Redefinition (SAMR) model, the Office of Educational Technology's *Future Ready* initiative, and the Partnership for 21<sup>st</sup> Century's 4Cs in their responses, there did not appear to be a consistent interpretation of those frameworks. Within the districts, little consistency in responses could be detected between participants, and descriptions did not align to the districts' published technology or strategic plans.

After examining both the quantitative and qualitative data, the researcher ascribed the problem of practice to a lack of communication and common language between the leaders in the districts rather than a hierarchical, bureaucratic culture. The needs assessment revealed that the central office and building leaders within each district held different perceptions and definitions of instructional innovation. Additionally, the qualitative analysis indicated both a lack of a common language to support the

articulation of any shared understanding and insufficient communication networks to diffuse that message throughout the micro and mesosystems of the districts. Through both the needs assessment data and the literature reviewed in chapter one, it became apparent that addressing the communication between central office and building leadership within the districts presented an opportunity for intervention.

### **The Role of Leaders in Communication**

Diffusion of new ideas and practices requires the presence of social structures that encourage communication between stakeholder groups (Rogers, 2004b). Particularly in American public education systems, stronger networks of communication between district and building leaders can improve the likelihood of systemic improvement (Daly et al., 2010; Daly & Finnigan, 2010; Spillane et al., 2012). When broadly examining effective implementations of innovation across sectors, Cina and Cummings (2018) found communication to be a critical component as it promotes interaction and feedback between stakeholders. In particular, they found that measuring the quantity and quality of feedback could serve as an indicator for how new ideas might permeate markets (Cina & Cummings, 2018). At the policy level, communication not only helps to build trust and cooperation between stakeholders, but also ensures that a clear and consistent message reaches those parties responsible for compliance with the initiative (Cline, 2018). Later sections in this chapter will further define communication based on how information flows through social networks (Finnigan & Daly, 2014) and the development of a common language of pedagogy (Mourshed et al., 2010).

A meta study of 93 articles published between 1998-2010 (Dexter, Richardson, & Nash, 2016) supports the importance of communication within the context of American

public education. Using the five domains of effective leadership from Tucker (2016) to organize their analysis, Dexter et al., (2016) presented evidence for the roles and responsibilities required by school and district leaders to successfully support systemic innovation of classroom practice to prepare students for the knowledge economy: vision based on a "clear understanding of the processes, outputs, and outcomes of technology use" (Dexter et al., 2016, p. 205); a process for collaboratively defining the impact of technology on pedagogy and then setting clear expectations for teachers; structures and resources to support teachers in the changing of their practice; a systemic approach that includes technology, resources, and instruction to support teachers; and distributed leadership to increase collaboration between diverse stakeholder groups. For innovation to take hold, the authors argue that conversations about innovation require a much broader scope than just discussion of technology (Dexter et al., 2016).

Other studies (McLeod, Richardson, & Sauers, 2015; Richardson, Sauers, & McLeod, 2015) into the tenets of technology leadership echo the claims made by Dexter et al. (2016). Both communication between stakeholder groups (e.g. principals, teachers, and other administrators) and a common language serve as critical pillars for implementing systemic innovation that infuses technology and implements a curriculum that embraces deeper learning, student agency, and authentic context (McLeod et al., 2015; McLeod & Shareski, 2018; Richardson et al., 2015). In one of the few empirical analyses of technology leadership, Sauers, Richardson, and McLeod (2014) used 10 years (2001-2011) of annual eSchoolNews award-winning, technology-savvy superintendents as a purposive sample to conduct a qualitative case study. The authors contacted 59 of the past 100 winners whose information could be located and asked them to take part in a

recorded interview. A final sample of 11 superintendents participated. One of the four themes that emerged from the interviews included communication to all stakeholder groups. In response, the researchers concluded that districts require multiple levels of stakeholder involvement and communication such that clear expectations and understanding of technology-use and instructional innovation could be made evident to all members of the district community (Sauers et al., 2014).

### **Communication to Support Organizational Learning**

When organizations do not possess the capacity to communicate a vision for a desired change, then reform movements often result in isolated efforts rather than systemic implementations (Evans, Thornton, & Usinger, 2012). In their essay, Evans et al. (2012) explain that district leaders and school principals often focus on individualistic approaches rather than a system-wide strategy driven by a specific framework. They argue that districts need to engage in organizational learning to develop shared values, engage in systems thinking, and coordinate across buildings. Citing Argyris and Schön (1996), Evans et al. (2012) explain that school leaders often provide information or direction yet need to advocate for critical reflection if they intend to create a meaningful organizational change in culture, policy, or belief. Further, they advocate that adopting Senge's (1990) five disciplines of organizational learning leads to the creation shared vision and mental models, increases organizational capacity, and fosters systems thinking. At the heart of each of theoretical framework discussed by Evans et al. (2012) lies the need for a shared culture, vision, and set of beliefs focused on improvement.

The needs assessment in chapter two revealed that leaders at the central office and building levels perceived that many of the tenets of learning communities existed within

their districts, and yet failed to effectively communicate and articulate a common conception of classroom practice to prepare students for the demands of the knowledge economy. By using Bronfenbrenner's (1979) Ecological Systems Theory as a theoretical framework for the design of the needs assessment in chapter two and the analysis of the literature in chapter one, the researcher identified that the problem of practice resided within the micro and mesosystems of American public school districts. The need for improved communication, shared language, and organizational learning between these networked micro and mesosystems (Neal & Neal, 2013) ultimately led the researcher to identify Senge's (1990; 2006) model of Organizational Learning Communities as the theoretical framework for the intervention. As discovered in the literature, if American public school districts hope to implement any type of systemic innovation, then they need to move away from traditional bureaucratic structures (Honig, 2006b) and towards organizational learning communities dedicated to building and sharing collective knowledge (Senge & Kim, 2013).

To identify possible designs for an intervention, this chapter next explores three prior studies that describe attempts to systemically innovate classroom practice to prepare students for the knowledge economy. Based on the needs assessment data, as well as those three studies, professional development, digital tools, and different community structures are then explored as possible intervention components. Finally, using Organizational Learning Communities (Senge 1990, 2006) as a theoretical framework, the researcher synthesizes literature to justify the development of digital resources to improve the quantity and quality of communication between central office and building



leaders, develop common language, and increase the districts' capacity for organizational learning.

### **Previous Intervention Studies to Address Systemic Innovation**

A literature search to examine communication in support of systemic innovation revealed very few intervention studies that examined communication between central office and building leaders. Though researchers such as Goddard et al. (2015) and Spillane et al. (2012) examined communication between leadership stakeholders within buildings, and the technology leadership literature (Dexter et al., 2016; McLeod et al., 2015; Richardson et al., 2015; Sauers et al., 2014) described the actual need for communication, few studies implemented interventions to address communication across entire districts. This next section presents three intervention studies that endeavored to help educational organizations systemically innovate classroom practice to foster students' knowledge economy skills. Analysis of these studies guided the design of the intervention described later in this chapter.

### **Interventions in International Systems**

The Innovative Teaching & Learning (ITL) project conducted by Microsoft Partners in Research and the Stanford Research Institute (SRI) found that when a school culture presented a common vision of innovation as well as coherent language and resources to support it, then the environment encouraged more innovative types of teaching (Microsoft Partners in Learning, 2011). Through a multiyear, multisite, global mixed-methods study, researchers examined schools as ecosystems to explore the potential for transforming teaching and learning with a focus on 21<sup>st</sup> century skills (SRI, 2009). Research questions explored how innovative teaching might contribute to 21<sup>st</sup>

century learning outcomes; examined the school-level conditions that contributed to innovation; and identified the national or regional program supports required to increase innovative teaching. The researchers operationalized *innovative teaching* as being student-centered, integrating technology, and creating learning opportunities that transcend the walls of the individual classrooms (SRI, 2009).

A key finding emerged during the second year of the study (2010-2011) which occurred in Australia, England, Finland, Indonesia, Mexico, Russia, and Senegal (Microsoft Partners in Learning, 2011). Though innovative teaching did support student acquisition of key 21<sup>st</sup> century skills, these opportunities seemed to occur rarely and inconsistently within and between sites. Systemic innovation only occurred when the school system had developed a common language of instruction and shared an understanding of how the environment could support it (Microsoft Partners in Learning, 2011).

As a result of the ITL project data, Shear, Patel, Trinidad, and Tan (2014) designed a professional development program called the 21st Century Learning Design (21CLD) specifically to build common language in support of innovation. They implemented the 21CLD program in a girls' school in Singapore with 1100 students, 90 teachers, and a history of technology integration. Though the school had instituted a 1:1 (one computer per student) learning environment over a decade earlier, leaders indicated a desire to achieve a stronger connection between technology and deeper learning. Through participation in the program, and the use of carefully designed tools to support instruction, technology became part of the pedagogical vision which then led to the construction of a broader set of mental models for innovation. The researchers attributed

the success of the program to the "carefully designed ecosystem of supports for innovation" (Shear et al., 2014, p. 85). Tenets of this system included teacher ownership, distributed leadership, and the development of common language based on the 21CLD framework to support communication about learning and instruction (Shear et al., 2014).

### **An Intervention in the U.S.**

Similar to the previous two studies, a team of researchers in the U.S. sought to understand how broader ideas about 21<sup>st</sup> century learning and global education might translate into classroom practice across an entire district (Choo, Sawch, Villanueva, & Chan, 2017). The researchers conducted their study in a small, suburban district in the Northeastern region of the U.S. with similar demographics as those districts who participated in the researcher's needs assessment and intervention. Schools within this district consistently rank at the top of the state, and over 50% of students attend highly selective or second-tier colleges and universities after graduating high school. In 2009, as part of a private innovation grant, the district held a community brainstorming session to revise the tenets of successful global learners for the 21<sup>st</sup> century. Not only did the district leadership hope to create a language and sense of cohesion around the competencies that students might need for future success, but they also endeavored to implement an actionable vision that would sustain systemic support (Choo et al., 2017).

To achieve this goal, the district implemented a multi-year, multi-phase plan (Choo et al., 2017). Between 2010 and 2013, district leaders gathered stakeholder input; set the vision through community conversations that involved parents, teachers, as well as students; and created cohorts to plan and pilot programs. During the 2014-15 school year, they enacted their plan and succeeded in achieving an 85% participation rate from

teachers across the district. Through semi-structured interviews, classroom observations, and document analysis, Choo et al. (2017) attribute the district's success to three key factors. First, the Superintendent created a new organizational structure and appointed a Director of Secondary Education as well as a Director of Elementary Education to incorporate the framework across the curriculum and ensure cohesion of message. Next, the Superintendent and Assistant Superintendent held regular meetings with building leaders — principals, assistant principals, curriculum coordinators, instructional coaches, etc. — to reinforce the vision for learning and stress its importance. Finally, building leaders held ongoing outreach via sub-committees and community conversations to gather input. Further, the leaders acted on that feedback, modified the curriculum as necessary, and reported back to the community so that stakeholders knew their messages had been heard (Choo et al., 2017).

Ultimately, the district created common language and coherence to define their vision of a global student and guide the enactment of critical thinking, creative problem-solving, collaboration, and communication across courses and grade levels (Choo et al., 2017). Similar to the ITL project (SRI, 2009) and the 21CLD program (Shear et al., 2014), the district in the Choo et al. (2017) case study attributed their systemic success to the establishment of common tools and protocols for communication, extended opportunities for professional development, and a focus on student learning. The data from the needs assessment revealed that neither the tools and protocols for communication nor a common language of instruction existed within the districts. Therefore, based on the data presented in chapter two as well as the findings from these three studies, the next section explores professional development, digital tools, and

different forms of learning communities as possible systems and structures to support the design of an intervention.

### **Possible Systems and Structures to Support Systemic Innovation**

#### **Professional Development as a System of Support**

Professional development played a central role in all three of the studies mentioned in the previous section. Particularly when presented with new technologies and instructional practices, teachers and administrators often claim that they need professional development or training to gain proficiency (Dede, Ketelhut, Whitehouse, Breit, & McCloskey, 2008). Multiple statements throughout the qualitative responses in the needs assessment corroborated this claim. When asked what they needed to encourage innovation, the Superintendent, Assistant Superintendent, three principals, and two coaches in Bridgetown all advocated for professional development that would not only help teachers to understand the functionality of digital tools and apps but also how to implement them in the curriculum. In Bayview, three central office administrators advocated for additional professional development for the teachers from the technology specialists, and three instructional technology specialists asserted that teachers needed more onsite coaching and support. Six of the eight principals from Hilltop also referenced the need for more professional development to foster innovation within their buildings.

However, a broader literature search found professional development largely ineffective for changing classroom practice (Gulamhussein, 2013; TNTP, 2015; Yoon, Duncan, Lee, Scarloss, & Shapley, 2007). As evidenced by a seminal study from Garet et al. (2001), and later corroborated by the 2015 Mirage (TNTP, 2015), 2013 Center for

Public Education (Gulamhussein, 2013), as well as the 2007 American Institutes for Research (Yoon et al., 2007) reports, most educators participate in activities "that appear insufficient to foster learning that would fundamentally alter what teachers teach or how they teach it" (Garet, Birman, Porter, Desimone, & Herman, 1999, p. 52). Additionally, despite frequent requests for professional development, most individuals contend that a lack of time and resources prevents them from gaining that opportunity (Dede et al., 2008).

To address the lack of time, Rienties, Brouwer, and Lygo-Baker (2013) investigated the potential for online, just-in-time professional development by examining the extent to which 81 higher education academics in the Netherlands could learn new instructional practices with technology by completing four online modules over 12 weeks. As a result of this intervention, the academics demonstrated a shift in their beliefs away from teacher-directed practices and expressed satisfaction with the online platform. Although this program occurred in a setting unlike that of the proposed intervention, and the authors questioned the generalizability of their results given the use of self-reported measures as well as lack of statistical power (Rienties et al., 2013), the study offers support for the creation of online resources to mitigate time constraints.

Further, Koehler and Mishra (2005) argue that traditional professional learning models perpetuate the view that technology exists as an additional component to master rather than as a pathway to learning. Instead, they propose a *learning by design* approach. In their discussion of three separate case studies, Koehler and Mishra (2005) assert that educators gain a deeper understanding of the intended pedagogy and purpose for technology when they leverage digital tools to address a specific problem rather than

learn tools in isolation. This design-based approach also contrasts with traditional classrooms and immerses educators in a new type of learning experience on which they can base future instructional decisions (Koehler & Mishra, 2005). A meta study of 400 articles about online, face-to-face, and hybrid professional development expands upon these claims (Dede et al., 2008). Not only did Dede et al. (2008) present additional evidence that online spaces can encourage reflection, collaboration, and just-in-time learning, but they also found that design-based programs allowed participants to gain experience and fluency with new technologies in ways that may not be possible in traditional professional development settings (Dede et al., 2008).

Though the previous studies examined the impact of professional development on teachers, Richardson, Flora, & Bathon (2013) conducted research with school and district leaders. Two cohorts of 20 doctoral students in Educational Leadership participated in a blended-learning course focused on educational technology and leadership over the course of two years. Using a phenomenological approach to understand how school and district leaders create vision statements for school technology, the authors explored the changes in school technology leadership vision statements as the leaders completed a blended-learning course focused on the International Society for Technology in Education (ISTE) National Education Technology Standards for Administrators (NETS-A). The authors qualitatively assessed pre and post-test vision statements from each student and categorized their statements based on the NETS-A. They then looked for major changes — defined as a detectable conceptual shift in language and a stronger alignment to the NETS-A standards — as well as minor changes in wording. Of particular note, 30% of the students made major changes in their statements to better

align to the standard for *Systemic Improvement*. The authors stated that they could not make any conclusions regarding the effectiveness of the intervention for enacting change, but they did assert that leaders benefitted from assistance in crafting their understanding of technology and their vision for its implementation. Through their participation in the blended-learning program, the leaders gained the language to communicate their vision for classroom technology-use more concisely, concretely, and effectively (Richardson et al., 2013).

Review of the professional development literature thus revealed that a traditional workshop model would neither be sufficient for changing stakeholders' beliefs about innovation of classroom practice, nor allow individuals to develop new literacies and fluencies to support conversations about technology. Therefore, the researcher eliminated traditional professional development as an option for intervention. However, certain elements of these professional development studies did show promise. First, the use of an online platform could reduce time constraints (Dede et al., 2008) and provide just-in-time access to professional development (Rienties et al., 2013). Second, incorporating digital tools would allow participants to use technology to address specific problems and engage in experiences that could inform future actions (Koehler & Mishra, 2005). Finally, as demonstrated by the qualitative study from Richardson et al. (2013), school and district leaders benefit from additional support to form language around systemic improvement and innovation. Therefore, the researcher next explored the potential for digital tools and resources to help improve communication, develop common language, and promote organizational learning.



## **Digital Tools to Build Learning Communities**

The quantitative data from the needs assessment showed that formal meeting and team structures existed to support communication and collaboration within the districts. For example, 46% of the building level educators indicated that their districts required a collaborative process for developing shared vision. Conversely, the qualitative data included participant comments about the desire for increased opportunities to support collaboration and reflection as well as a need for shared values and norms. This contradiction between the quantitative and qualitative data led the researcher to believe that the leadership stakeholders do not possess the tools to engage in productive communication about innovation. A qualitative case study of a 40-member leadership team consisting of administrators, teachers, parents, and outside community members in the Metropolitan School District of Decatur Township (MSDDT) near Indianapolis discovered a similar conflict between the existence of structures and the perceptions of the quality of communication (Chen & Reigeluth, 2010).

In their analysis of the School System Transformation model in MSDDT, researchers examined the communication patterns of the leadership team; the values, perceptions, and beliefs of the team members; the means and sources of communication; as well as communication deficiencies (Chen & Reigeluth, 2010). Observations, surveys, focus groups, interviews, and document analysis revealed that communication direction primarily occurred as a result of hierarchical ranks. Despite regularly scheduled monthly meetings, such as those in each of the districts from the needs assessment, participants viewed most communication as inefficient (Chen & Reigeluth, 2010). Though the context of this study differs from that of the intervention, it does provide insight into the

need for resources and tools to cultivate productive communication within the existing organizational structures.

However, unlike professionals outside of education who have adapted to digital tools and changed their work processes accordingly, many educators do not conceptualize technology as a critical component of innovative teaching, learning, and working (Ertmer & Ottenbreit-Leftwich, 2010). To achieve this shift in mindset and adopt new beliefs about the role of technology and innovation in education, educators require a greater understanding of what those principles look like in practice (Ertmer & Ottenbreit-Leftwich, 2010). Paradoxically, the school and district leaders responsible for creating supportive policies and articulating those principles often lack sufficient experience with both technology and new classroom practices to craft a cohesive and coherent message (Richardson et al., 2013). This need to provide district and school leaders with an opportunity to build capacity and experience using technology, combined with the necessity to present leaders with tools that support communication, formed the impetus to incorporate digital tools into the design of the intervention.

Allowing for both synchronous and asynchronous collaboration and communication, digital technologies facilitate sharing, feedback, and reflection (Scardamalia & Bereiter, 1994). Additionally, online environments enable participants to transcend formal organizational structures so that they can learn from each other and form new formal as well as informal connections (Brown & Duguid, 1991). The knowledge products created by using digital resources can then support the districts' organizational learning capacity as participants work to establish common language in support of innovation with technology. Although communication, knowledge

construction, and reflection could occur without digital resources, technology "overcome(s) the danger of loss of continuity" (Bereiter & Scardamalia, 2014, p.42) when discourses become spread out across a number of platforms and face-to-face encounters.

As will be described later in this chapter, the digital resources designed for the intervention intended to encourage dialog, support intentional learning, and help transform districts from separated silos into knowledge-building communities (Scardamalia & Bereiter, 1994). Technologies that educators already use in their personal or professional lives, that require little change in practice, and that demonstrate an immediate benefit, tend to be assimilated more quickly (Zhao & Frank, 2003). Because the participating districts had already adopted *Google for Education* (Google's free collaboration and productivity platform), the researcher developed the digital resources within that environment to minimize the need for tool-specific training and maximize the potential for community learning.

Though the quantitative data from the PLCA-R (Olivier et al., 2009) intimated that the districts who participated in the needs assessment already perceived that they operate as a learning community, the qualitative data contradicted this finding. By employing Bronfenbrenner's (1979) Ecological Systems Theory as a lens through which to examine the problem of practice, it became apparent that the improving the communication interactions between the networked micro and mesosystems of districts (Neal & Neal, 2013) presented an opportunity for intervention. Therefore, this literature review next examines three community structures — Professional Learning Communities (PLCs), Networked Improvement Communities (NICs), and Organizational Learning

Communities (OLCs) — as a means to strengthen the communication connections within the districts and as a theoretical framework to guide the design of the intervention.

### **Community Structures**

**Professional Learning Communities (PLCs).** A Professional Learning Community (PLC) can be characterized by shared leadership, values, and vision; collective learning; shared practice; as well as supportive relationships and structures (Hipp, Huffman, Pankake, & Olivier, 2008). Goddard et al. (2015) assert that when an instructional leader fosters a PLC with the goal of improved teacher practice, then student achievement may result as an indirect outcome. Further, a more recent study by Spillane, Shirrell, and Sweet (2017) echoed these findings that increased collaboration within a learning community should lead to the diffusion of new instructional practices. However, given that each of these three studies focused on elementary schools, the results may not be generalizable to secondary schools or other contexts with more complex organizational structures. Though the intervention targeted smaller districts than those in these studies, the complexity of working across K-12 districts rather than just elementary schools raised questions about the viability of a PLC as an intervention model.

To examine the potential for professional learning communities at the district level, Honig and Rainey (2014) conducted a comparative case study of six central office Principal Professional Learning Communities (PPLCs) designed to improve instructional leadership in one mid-sized urban district. They found that the PLC structure had diverse impacts on achieving the goal of systemic improvement amongst principals. The researchers completed 105 hours of observations, conducted semi-structured interviews with central office leaders, as well as analyzed 150 related documents between November

2007 and June 2008. Because members did not share a common vision for instructional leadership before implementing the PPLC model, the intervention had varying effects (Honig & Rainey, 2014). Data collected during the needs assessment indicated that a common language and vision did not exist as a pre-existing condition in the districts targeted for intervention, further weakening the argument for implementing a PLC.

Finally, as an additional pre-existing condition, a PLC requires the presence of collegial trust and collective efficacy within an organization (Gray, Mitchell, & Tarter, 2014). Employing a sample of 3700 teachers from 67 schools in a Southeastern district, Gray et al. (2014) held collegial trust, supporting school structures, collective efficacy, and principal trust as independent variables and then used multiple valid scales to measure their impact against the formation of a PLC. The results indicated that a positive correlation exists between the existence of these factors and the effectiveness of the PLC. Therefore, the authors argue that these conditions must be present before attempting to implement a PLC within an organization (Gray et al., 2014).

As mentioned in the previous chapter, the needs assessment revealed that a consistent vision did not exist as a pre-existing condition within the districts targeted for intervention. Collective efficacy, collegial trust, and supporting structures also did not seem to be entrenched within the districts as implied by the variation detected between the quantitative and qualitative data. Finally, given the level of organizational complexity associated with working across an entire district, a PLC model did not appear to be an ineffective organizational structure to guide the design of this intervention.

**Network Improvement Communities (NICs).** Unlike a PLC, a Network Improvement Community (NIC) evolves to more deeply understand a problem, develop a

theoretical framework, establish measurable objectives, and foster collective leadership (Martin & Gobstein, 2015). In addition to focusing on a common aim, a NIC includes a theory of improvement, disciplined methods to test interventions, and an organization designed to accelerate the diffusion of information into the field (Bryk et al., 2015). These tenets of a NIC provide a language and structure for change (Bryk et al., 2015) with a singular focus on the goal of systemic improvement (Bryk, Gomez, & Grunow, 2010). Further, a NIC assumes that its members share a common language - a condition that the needs assessment showed not to exist - have the capacity to see the larger system, and can work in measurable ways (Bryk et al., 2015).

NICs serve as systematized and formalized learning collectives that embrace an iterative process towards improvement (Bryk et al., 2015). Formed to address a specific problem of practice, NICs require a shared language, a commitment to ongoing assessment, and both strong leadership as well as dedicated membership (Bryk et al., 2015). While a NIC certainly presented several benefits as an intervention framework, its success would require an ability to define the problem and drivers, the capacity to engage in iterative and measurable improvement cycles, as well as the leadership and organizational structures to support its existence (Martin & Gobstein, 2015). As evidenced in the previous chapter, these structures and capacities did not seem to be present within the districts targeted for intervention and would need to be developed through organizational learning as a theory of change (Evans et al., 2012).

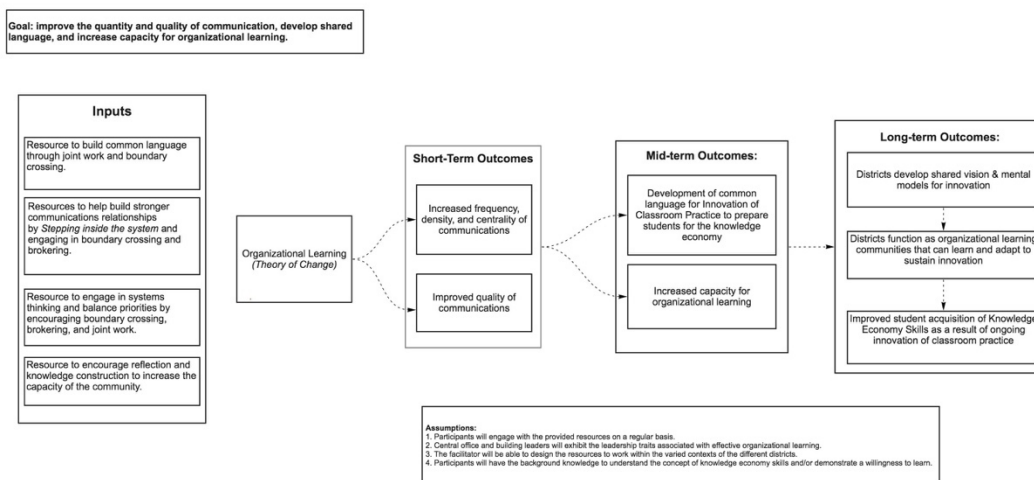
**Organizational Learning Communities (OLCs).** When organizations lack a common understanding to support a new initiative, then reform movements often result in sporadic efforts rather than systemic change (Evans et al., 2012). To achieve the goal of

systemic innovation of classroom practice to prepare students for the knowledge economy requires districts to improve communication between the layers in their organization such that members ultimately build collective knowledge - a trait associated with Organizational Learning Communities (OLCs) (Senge & Kim, 2013). In his seminal book, *The Fifth Discipline*, Senge (1990) explains that participants in an OLC engage in five disciplines: achieving personal mastery, forming mental models, constructing shared vision, engaging in team learning, and employing systems thinking. When organizational members engage in these disciplines, they develop the capacity to learn and change (Evans et al., 2012).

According to Senge and Kim (2013), three interrelated activities then promote organizational learning: theory-building, practice, and capacity-building. In the intervention, the process of developing common language to support innovation of classroom practice served as theory-building. Practice occurred when participants engaged in sociocultural activities by using the digital resources as they communicated and collaborated with colleagues. Finally, improved quantity and quality of communication resulting from the strengthening of social networks (Daly & Finnigan, 2010; Frank, Zhao, & Borman, 2004; Umekubo, Chrispeels, & Daly, 2015) intended to increase organizational learning capability (Goh, Quon, & Cousins, 2007) and serve as an indicator of capacity-building.

As illustrated by the theory of change model (Figure 3), and explained in the following sections, the intervention used organizational learning (Senge, 1990;2006) as a theoretical framework and proposed for the following to occur. Participants engage in sociocultural activities (practice) when using the digital resources. These actions increase

the quantity and quality of communication between central office and building leaders to strengthen social ties and support the creation of common language to describe innovation of classroom practice (theory-building). As a result of the communication and language construction, districts would engage in organizational learning (capacity-building). Though chapter four describes the specific details of the intervention program, the remainder of this chapter presents the literature that supports the design of the digital resources.



*Figure 3.* Theory of Change model. Description of intervention goal, inputs, associated outcomes, and assumptions.

## Design of the Digital Resources

After considering various professional development models, digital tools, as well as structures to support community building, the researcher decided to build an intervention program around a set of digital resources intended to promote communication, the development of common language, and the capacity for organizational learning. This decision unfolded as a result of the literature reviewed earlier in this chapter. The idea to create tools and protocols for communication as well as extended opportunities for professional learning emerged from the ITL (SRI, 2009),



21CLD (Shear et al., 2014), and Choo et al. (2007) studies. Using an online platform to reduce time constraints (Dede et al., 2008), provide just-in-time access to professional development (Rienties et al., 2013), and encourage leaders to use technology for problem solving (Koehler & Mishra, 2005) evolved from the professional development literature. The interrelated organizational learning activities of theory-building, practice, and capacity-building (Senge & Kim, 2013) then became the theoretical framework guiding the design of the resources. For the remainder of the chapter, the researcher describes how each resource encourages the activities of organizational learning (theory-building, practice, and capacity-building) and presents the literature that supports their design.

### **Theory-Building: Digital Resources to Create Common Language**

According to Senge and Kim (2013), theory-building refers to the process of constructing the foundational knowledge on which an organizational learning community then makes decisions. Within the context of this intervention, the development of shared language to describe innovation of classroom practice constitutes theory-building. The needs assessment revealed that this common language does not exist within the districts; and yet, a shared language of pedagogy exists as a central tenet of great and excellent systems (Mourshed et al., 2010). This language must extend beyond isolated tips or strategies and provide a framework to support discussion about practices to improve student learning (Mourshed et al., 2010). Therefore, the first digital resource presents a protocol to help participants build a common understanding of innovation in context and the language to communicate the desired practice throughout the ecosystem of the district.

Oftentimes, conversations about innovation focuses on the frequency of technology use rather than pedagogy (Li & Choi, 2013), the replication or digitization of traditional tasks (Ertmer & Ottenbreit-Leftwich, 2010; McLeod, 2015), or the optimizing of existing routines (Reich et al., 2012). Despite the affordances of new tools and devices, educators and administrators typically consider technology as a means to present a lecture, type a paper, or collect an assignment (Ertmer & Ottenbreit-Leftwich, 2010). Rarely do educators employ technologies to encourage students to engage in knowledge construction or apply their learning to an authentic context — standards outlined by both the International Society for Technology in Education and Partnership for 21st Century Schools (Ertmer & Ottenbreit-Leftwich, 2010). As described by McLeod (2015),

In school after school, we see students and teachers doing the same things that they used to do in analog classrooms — but with more expensive tools — rather than taking advantage of the new affordances that the technologies bring to the learning environment. (p. 228).

Therefore, the language to describe innovation of classroom practice needs to expand beyond just discussion of technology access or usage and instead requires the use of pedagogy as a construct (Li & Choi, 2013). The Technological Pedagogical and Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) adds the element of technology to Shulman's concept of Pedagogical Content Knowledge (PCK) which addresses the fusion of pedagogical and academic content knowledge to support teacher practice (Shulman, 1986 as cited in Mishra & Koehler, 2006). Traditional conversations about technology often separate it from discussions of pedagogy and content (Mishra & Koehler, 2006), but the TPACK framework helps to develop a more robust language for

describing innovation with technology such that it addresses creativity, critical thinking, and problem-solving rather than merely access to devices (Henriksen, Mishra, & Fisser, 2016). Within the context of the intervention, to develop a common language to describe innovation, participants had access to a digital resource designed to incorporate elements of the TPACK framework (Mishra & Koehler, 2006), the Technology-Rich Unit Design and Classroom Observation Template (trudacot) protocol (McLeod, 2015), and the previously mentioned 21st Century Learning Design (21CLD) Activity Rubrics (Microsoft Partners in Learning, 2011).

***Technology for the Purpose Of... Resource for Developing Language.*** In their book, *Different Schools for a Different World*, McLeod and Shareski (2018) advocate for school leaders to consider *Four Big Shifts* in their thinking about innovation: higher-level thinking, student agency, authentic work, and technology infusion. Previously, McLeod (2015) described these shifts as components of the trudacot protocol. To help participants engage in discussions centered around the idea of identifying "technology for the purpose of what?" (McLeod, 2015, p.229), trudacot leverages the tenets of TPACK and other popular technology frameworks such as Dr. Ruben Puentedura's Substitution-Augmentation-Modification-Redefinition (SAMR) model and the Arizona K-12 Technology Integration Matrix (TIM). Unlike TPACK, SAMR, and TIM, trudacot provides specific questions to help participants recognize ways in which they could change the design of their instruction to achieve the goals of deeper learning, greater student voice and choice, more authentic work, and richer technology integration (McLeod, 2015).

Though McLeod (2015) as well as McLeod and Shareski (2018) consider technology infusion to be a change unto itself, the activities rubrics developed as part of the 21CLD project (Shear et al., 2014) encourages educators and administrators to identify and define learning opportunities for students before associating related technologies with the desired practice (Microsoft Partners in Learning, 2016). The *Technology for the Purpose of...* resource (see Appendix D) combined tenets of trudacot (McLeod, 2015) and the 21CLD rubrics (Shear et al., 2014) to provide educators with a set of protocols to discuss technology infusion alongside the bigger ideas of deeper learning, personalized learning (the term that the intervention sites used to address student agency), and authentic learning. Intended to be used for brainstorming, planning, and curriculum design, this resource offered a protocol to help leaders describe innovation of classroom practice such that it extended beyond just the use of technology and incorporated pedagogical language (Li & Choi, 2013). As designed, this resource aimed to help district and building leaders articulate the desired tenets of learning activities that would address critical knowledge economy skills such as solving unstructured problems, seeking out creative solutions to novel situations, and leveraging technology to complete nonroutine tasks (Levy & Murnane, 2013).

### **Practice: Digital Resources to Foster Sociocultural Activities**

As mentioned, organizational learning promotes three activities: theory-building, practice, and capacity-building. Whereas the previous section described *theory-building* as the development of common language to describe innovation, this section defines *practice* as the activities that allow information and advice to flow through the social networks between the individuals (Finnigan & Daly, 2014) that comprise the micro and

mesosystems of districts. This process of communication occurs as a result of engaging in the sociocultural activities of joint work, boundary-spanning, and brokering (Honig, 2008; 2012; Honig & Rainey, 2014; Swinnerton, 2007). Within the theoretical framework of organizational learning communities, *practice* serves as the bridge between *theory-building* and *capacity-building* as it represents activities performed to produce an outcome (Senge & Kim, 2013). In the context of this intervention, the sociocultural activities (practice) intend to support the development of shared language (theory-building) as well as an increase the districts' capacity for organizational learning (capacity-building).

**Joint Work to Promote Communication and Collaboration.** According to sociocultural theory, individuals construct learning through social interactions within their environments (Vygotsky, 1962). In the context of organizational learning, these activities manifest themselves in the form of team learning as members participate in joint work - activities that participants engage in equally (Honig, 2008). Within the hierarchical structures of public school bureaucracies, work regularly occurs as a top-down mandate or one-way communication (Honig, 2008). However, team learning and joint work value the strengths of individuals and promotes more positive systemic change (Evans et al., 2012).

In a qualitative case study, Honig and Rainey (2014) conducted observations and interviews with central office administrators charged with coordinating Principal Professional Learning Communities (PPLCs). The researchers focused on the use of joint work within the community to help principals gain a deeper understanding of instructional leadership. Parties who understood the value of their efforts to the broader

community and engaged in the process of joint work experienced the most success (Honig & Rainey, 2014). To co-create language in support of systemic innovation, participants need to engage in joint work that all parties find mutually beneficial (Honig, 2008). Within the context of this intervention, multiple resources intended to encourage joint work. This sociocultural activity could occur when using the *Technology for the Purpose Of...* resource for building common language as well as when employing the tools described below. Both the *Essential Improvements* and *Polarity Mapping* resources (see Appendix D) aimed to promote conversations about implementing change.

***How Might We... Identify & Define Essential Improvements.*** In the needs assessment, 52% of participants indicated a desire for more explicit programs and policies to guide innovation. The *Essential Improvements* resource attempted to accomplish that objective as well as to create a balance between near and long-term goals (Sauers et al., 2014). Using the structure of a *visible thinking routine*, a series of prompts designed to guide thinking and reflection (Perkins, 2003), this resource encouraged participants to collaborate and engage in joint work as they responded to the three essential questions modified from those that drive Improvement Science (Bryk et al., 2015; Perla, Provost, & Parry, 2013): (a) *How might we make a change in environment, behavior, and/or beliefs to improve student learning?*; (b) *Why might we implement that change?*; and (c) *How might we know if it worked? (What is an observable measure?)*. By working through the sequence of questions, participants could identify a desired change in practice — whether it be a near or long-term goal, provide a rationale for that change, and then identify an observable measurement to indicate that the change occurred.

As evidenced by the analysis of the technology and strategic plans in chapter two, the districts who participated in the intervention previously focused more on the technologies themselves (environment) than their impact on classroom practice (behaviors and beliefs). Therefore, the first question in this resource asked participants to consider not only the desired environmental change (e.g. new technologies), but also the behaviors and beliefs that they hoped to affect. However, complex problem definition such as this often requires unconventional, non-evaluative thinking (Basadur, Ellspermann, & Evans, 1994). One strategy for encouraging this type of cognition lies in using the "imaginative problem definition statement 'How might we...'" (Basadur et al., 1994, p. 630). Structuring the resource with this statement encouraged generative thinking and framed problems as positive opportunities instead of negative assessments (Basadur et al., 1994).

After considering the reasoning behind implementing the desired change, the third question asked participants to identify an observable measure as evidence of the effectiveness of the intended improvement. Though educators often use formal documentation or quantitative assessments as evidence of change, storytelling and rich descriptions explain how that change came into existence and contribute to the organizations' institutional knowledge (Brown & Duguid, 1991). Descriptions of these observable measures document the desired practice, stimulate social knowledge construction through joint work, and cultivate common language based on the shared experience (Brown & Duguid, 1991).

***Balancing Polarities in the System.*** To make improvements such that they support innovation, participants required a means to see the interactions of the

components within the system itself (LeMahieu, Edwards, & Gomez, 2015). Identifying and understanding interdependent relationships helps to frame new changes as a both/and polarity rather than an either/or debate (Pacanowsky, 1995). Polarities exist as "interdependent pairs" (Johnson, 1992, p. 207) where one side may be viewed as a problem and the other a solution to the same common issue (Kise, 2014a). Common polarities that manifested themselves in the qualitative responses from the needs assessment included paper/digital resources, student-centered/teacher-directed instruction, or traditional instruction/ innovative practices. The process of engaging in polarity mapping (Johnson, 1992; Kise, 2014a; 2014b) accomplishes the goal of finding balance and mitigating conflict between seemingly competing ideas while also fostering team learning (Senge, 1990) through joint work (Honig, 2008; Honig & Rainey, 2014).

To help build common language for innovation of classroom practice, participants leveraged the polarity mapping tool to find balance in the system (Kise, 2014b). Through their interactions with this resource, participants jointly acknowledged both sides of an interdependent pair and developed concrete action steps by intentionally addressing the entire system (Kise, 2014b). Polarity mapping encouraged participants to engage in joint work such that they defined the purpose of their change efforts while also acknowledging the underlying values and concerns of others within their district (Kise, 2014a). Outputs from this tool included concrete, co-constructed action steps or expectations (Kise, 2014a) and provided participants with a means to better understand the various components of their context (Bryk, 2010).

**Boundary Crossing and Brokering to Improve Communication.** Successful reform requires a shift from a segmented focus of change to a systemic one that includes



communication and shared understanding (Daly et al., 2010). For example, the National College of School Leadership's (NCSL) Network Learning Group in the UK implemented multiple reforms across 104 schools by focusing on frequent communication between sites and the development of a common understanding of reform efforts. These strategies strengthened the social ties between various stakeholder groups in support of whole-system change (Daly et al., 2010). Unfortunately, since many American public school districts still predominately exist as hierarchical bureaucracies instead of networked professions (Mehta, 2013a), bridging the disparate communities within a district to communicate about innovation of classroom practice requires practical tools that encourage boundary crossing and brokering (Honig, 2008). Boundary crossers translate policy into practice and promote organizational goals throughout the district ecosystem. Brokers position themselves within the community to bridge theory and reality (Honig, 2008). District leaders in particular may play both roles as they span the boundaries between buildings to better broker information and communicate the intent of policy messages (Finnigan & Daly, 2014).

During a qualitative, cross-case analysis of three urban school districts in Atlanta, New York, and Oakland, Honig (2012) conducted 283 semi-structured interviews with 162 central office administrators, principals, and related representatives to determine how executive-level central office administrators — known as Instructional Leadership Directors (ILDs) — could support principals in developing their instructional leadership. Successful ILDs regularly served as boundary crossers between the principals and the district leadership to ensure that both groups understood and received the same information. Further, the ILDs who brokered between the principals and other central

office leaders managed to keep competing priorities and administrative work from detracting from the overarching objective (Honig, 2012).

Though Honig (2012) claimed that those findings may not be generalizable since the study occurred in strategic sites possessing specific conditions, Swinnerton (2007) uncovered similar patterns of boundary crossing and brokering in a separate qualitative study. Her position in the study as a participant observer provided her with a unique vantage point to view how coaches constantly moved between and among central offices, schools, and classrooms. She noticed that coaches not only navigated the boundaries within the district ecosystem, communicating and translating the intent of messages, but also brokered relationships and engaged in diplomacy by negotiating responsibilities to ensure the implementation of the desired instructional practices (Swinnerton, 2007).

All of the previously mentioned digital resources could support these activities of boundary crossing and brokering. Assuming that participants collaborated with their colleagues when completing the protocols, they would engage in communication across the layers in their organization to promote the desired practices. However, these resources assumed that the users recognized and understood the social context within the system. To take a more user-centered, problem-specific approach (Bryk et al., 2015) participants also had access to two resources designed to encourage empathy. By systematically engaging in empathy, participants mitigate the bias of their personal worldview to seek out the problems of others and perceive the broader perspective (Liedtka, 2014) such that they can more effectively navigate between the layers in the organization (Honig, 2012) and broker between different parties (Swinnerton, 2007).

***Step Inside the System.*** As will be described in the next chapter, the sample of participants for this intervention included district administrators, principals and assistant principals, as well as coordinators and coaches — educators with the responsibility of supporting the instructional practices of classroom teachers. As such, the classroom practice that they planned to innovate belonged to another educator. Engaging in empathy afforded participants an opportunity to uncover the true needs of others and develop a deeper understanding of their colleagues' intrinsic beliefs (Stanford University Institute of Design, 2014). An *Empathy Map* served as one tool to accomplish this goal. When interacting with another educator, or reflecting on a conversation, participants could use this resource to capture observations and gain new insights by noting what the other person might *say, do, think, and feel*. After completing an empathy map, participants might identify new insights to help them communicate more effectively with this individual or identify possible problems to address (Stanford University Institute of Design, 2014).

Another anticipated challenge included finding an entry point to begin conversations. Researchers from Harvard University's Project Zero created the *Think-Feel-Care* thinking routine to explore the complexity of microsystems by forcing the user to consider the thoughts, emotions, and values of others (Clapp, Ross, Ryan, & Tishman, 2017). Thinking routines convert cognition into a visible form (Perkins, 2003) by scaffolding what Vygotsky (1978) would describe as internalization - the process by which thinking and cognitive processes become salient through social interaction with available tools (Vygotsky, 1978 as cited in Perkins, 2003). The *Think-Feel-Care* routine encouraged participants to explore the perspectives of others who might interact within

their immediate microsystem (Clapp et al., 2017). By employing this resource, participants gained greater insights into the thoughts, perceptions, and beliefs of others (Clapp et al., 2017).

Both of these resources — the *Empathy Map* and the *Think-Feel-Care* thinking routine — intended to help participants step inside the system and facilitate the activities of boundary crossing and brokering to implement specific practices as well as to improve communication between the stakeholders in each district (Finnigan & Daly, 2014; Honig, 2008). When combined with the practice of joint work (Honig & Rainey, 2014), the potential emerged for districts to take a systems approach to innovation as described by Senge's (1990; 2006) model for organizational learning. The researcher assumed that using the digital resources would serve as a catalyst for engaging in the sociocultural activities. As a result of those activities, districts would experience improved communication between participants, the development of common language, and ultimately increased organizational learning.

### **Capacity-Building: Increased Communication and Organizational Learning**

Organizational learning serves as a critical component for organizational change, and developing that learning culture requires ongoing interactions between the members of the organization (Umekubo et al., 2015). The sociocultural activities of joint work, boundary-spanning, and brokering (Honig, 2008;2012; Honig & Rainey, 2014; Swinnerton, 2007) — if fostered by the use of the digital resources — would encourage the requisite communication between leadership groups. As a result of this practice, districts would improve communication and build common language to increase their capacity for organizational learning.

To understand the influence of communication within learning organizations, Umekubo et al. (2015) conducted a case study of an urban, elementary district cohort striving to foster relationships between the central office and school leaders. Using Senge's (2006) tenets of a learning organization as the framework for their analysis, the authors conducted semi-structured interviews with principals, focus groups with teachers, and a central office survey to compare the behaviors and practices of the principals within two separate cohorts. The authors found that the cohort with the strongest social ties, as evidenced by the quantity and quality of communication captured by social network analysis, also possessed the greatest capacity to support reform efforts (Umekubo et al., 2015).

Two other studies used social network analysis to examine the relationship between social ties, communication, and organizational capacity. Both Daly et al. (2010) as well as Daly & Finnigan (2010) found that stronger social networks led to increased capacity for change. By examining the external processes and procedures associated with reform efforts as well as the internal social structures between teachers and principals, Daly et al. (2010) attempted to understand the underlying patterns within schools as well as the social connections throughout the system of the district that may impact change over time. Through an exploratory case study, Daly et al. (2010) analyzed three social networks in a sample of five elementary schools within an underperforming urban district near San Diego, CA. Survey data gathered from 196 teachers, principals, and coaches across five schools as well as 12, semi-structured, teacher interviews indicated that principals served as the primary conduit for reform information. Given the hierarchical nature of the district, the central office often informed the principal about the desired

change and then assumed that information would be communicated to the teachers. However, analysis revealed that the principals did not consistently convey the information to their teachers, implying a lack of boundary-spanning (Honig 2008), which led to different interpretations and executions of reform (Daly et al., 2010).

To complement the analysis completed by Daly et al. (2010), Daly and Finnigan (2010) used an exploratory case study to examine the communication and knowledge networks between building principals and central office administrators in a mid-sized, urban district near Los Angeles, California. This study revealed that sparse ties existed between the building and central office leaders, and that most interactions consisted of one-way communication from the central office to the building principals (Daly & Finnigan, 2010) rather than bi-directional communication such as that associated with joint work (Honig & Rainey, 2014) and brokering (Honig 2008). Combined, these studies illustrate the correlation between the strength of the social networks between individuals within districts and the capacity to communicate ideas throughout the organization (Frank et al., 2004).

As described in the previous sections of this chapter, within the theoretical framework of Organizational Learning Communities (OLCs) (Senge, 1990), theory-building constitutes the creation of common language to support innovation of classroom practice to prepare students with future skills for the knowledge economy. Practice then occurs when participants engage in joint work (Honig, 2012; Honig & Rainey, 2014), boundary-spanning, and brokering (Honig, 2008; Swinnerton, 2007) while interacting with the digital resources. Capacity-building activities such as the strengthening of social networks through increased quantity and quality of communication (Daly & Finnigan,

2010; Frank et al., 2004; Umekubo et al., 2015) connects the practice of the sociocultural activities to the theory-building of common language as a means to create new capabilities for organizational learning and change (Senge & Kim, 2013).

Districts require this capacity to communicate between the layers in the organization and use a common language across the various groups (Frank et al., 2004) if they intend to systemically innovate classroom practice and prepare students for the demands of the knowledge economy. Participants who implement this style of communication provide a key structural support by helping to perpetuate innovation throughout the ecosystem of the district (Shepherd et al., 2010). Ultimately, improved communication represents a critical component of the requisite systems and supports that teachers need if they want to innovate within the myriad systems influencing their schools and districts (Martinez et al., 2016).

### **Conclusion**

To prepare students for the intellectual and technological demands of the knowledge economy (Levy & Murnane, 2013), teachers need to adopt classroom practices that foster their students' critical thinking, creativity, and problem-solving skills (Soulé & Warrick, 2015) within a system that supports instructional innovation (Martinez et al., 2016). Both the data from the needs assessment and the literature explored in this chapter indicate that communication between stakeholder groups as well as the use of common language to describe innovation exist as two critical components of that system of support. After examining three studies to identify potential intervention designs, and then additional literature to explore both the positives and negatives of various intervention components, this chapter described the design of a set of digital resources

using Senge's (1990, 2006) concept of organizational learning communities as a theoretical framework.

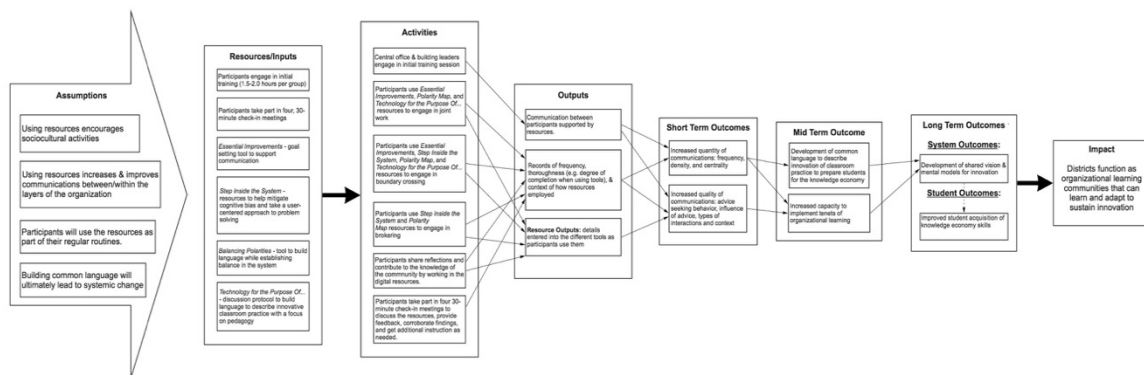
During the Fall of 2017, three districts in the Northeastern region of the U.S. participated in the intervention. Each site received a set of digital resources intended to nurture sociocultural activities, improve communication, build common language for innovation of classroom practice, and increase the organizational learning capacity of the district. As will be discussed in the next chapter, the researcher conducted an explanatory, multi-site case study as a variant on an embedded mixed-methods research design to evaluate the program implementation and outcomes of the intervention (Creswell & Plano Clark, 2011). Not only did this design allow the researcher to compare findings across the participating districts, but it also afforded a deeper understanding of the outcomes by incorporating a process evaluation to assess the fidelity of the program implementation. Through this mixed methods approach, the data from the mostly qualitative process evaluation offered explanations for the findings of the predominately quantitative outcome study (Creswell & Plano Clark, 2011). Given the unanticipated responses by participants to the intervention, this research methodology proved to be invaluable for understanding the dynamics that occurred.



## Chapter 4

### Intervention Design: Method and Procedure

The previous chapter identified the potential for leveraging digital resources to encourage activities that promote communication, the development of common language to describe innovation of classroom practice to prepare students for the knowledge economy, and the potential to engage in organizational learning. After examining the professional development literature, discussion of digital tools, as well as three types of learning communities, the researcher developed a theory of change based on Senge's (1990; 2006) concept of Organizational Learning Communities (OLCs). This theory of change served as the foundation for a logic model (see Figure 4) which defined the program elements of the intervention and illustrated the connections between inputs, activities, and outcomes (Cooksy, Gill, & Kelly, 2001).



*Figure 4.* Logic Model. Description of intervention assumptions, inputs, activities, outputs, and outcomes

According to the logic model, central office and building leaders from three districts in the Northeastern U.S. interacted with the digital resources described in the previous chapter to engage in the sociocultural activities of joint work, boundary-spanning, and brokering (Honig, 2008; 2012; Honig & Rainey, 2014; Swinnerton, 2007).

The activities and inputs on the left-side of the model intended to produce the proximal outcomes of increased quantity and quality of communication through the strengthening of social ties (Daly et al., 2010; Daly & Finnigan, 2010; Umekubo et al., 2015) and the development of shared language. Though the logic model includes the creation of shared vision as well as improved student achievement of knowledge economy skills as long-term outcomes, the evaluation study described in this chapter focus on the proximal and medial outcomes of quantity and quality of communication, the development of common language, and the potential to increase districts' capacity for organizational learning.

The goal of the study was to triangulate findings from multiple data sources to determine whether participating in the intervention improved communication, supported the development of shared language, and increased each district's capacity for organizational learning. As such, the researcher designed a multi-site case study as a variant on an embedded, mixed-methods design (Creswell & Plano Clark, 2011). With this design, a secondary process evaluation is embedded within a primary outcome evaluation to support inferences about the findings (Creswell & Plano Clark, 2011). To measure the outcomes, the researcher asked the following questions:

RQ1: To what degree did using the digital resources affect the organizational learning capacity of the districts?

RQ2: How did the language used by participants to describe innovative classroom practice to prepare students for the knowledge economy change as a result of using the resources?

RQ3: How did engaging in the sociocultural activities with the resources affect communication between the participants within their districts?

Since the embedded, mixed-methods research design not only addressed these outcome questions to assess the program's effect but also the fidelity of program implementation. The researcher also asked the following evaluation questions:

EQ1: With what frequency did the participants use the different resources?

EQ2: How did participants use the digital resources to engage in conversations about innovation of classroom practice with members from different stakeholder groups in their district?

EQ3: How did the participants within the different districts use the same set of digital resources?

- EQ3a. Given that each district received the same resources, did existing strategic or technology plans moderate participants' choice of resources or use of the tools?
- EQ3b. Did the existing organizational structures of the districts moderate the effects of the intervention program?

EQ4: To what extent did the implementation of the program adhere to the intended design?

This chapter defines the outcome and process evaluations for the implementation of the digital resources intended to improve communication and organizational learning. The research design addresses both the fidelity of implementation as well as the assessment of the proximal and medial outcomes. First, this chapter explains the use of a multi-site case study as a variant on an embedded, mixed-methods research design. Then, the researcher describes participant recruitment, the outcome and process

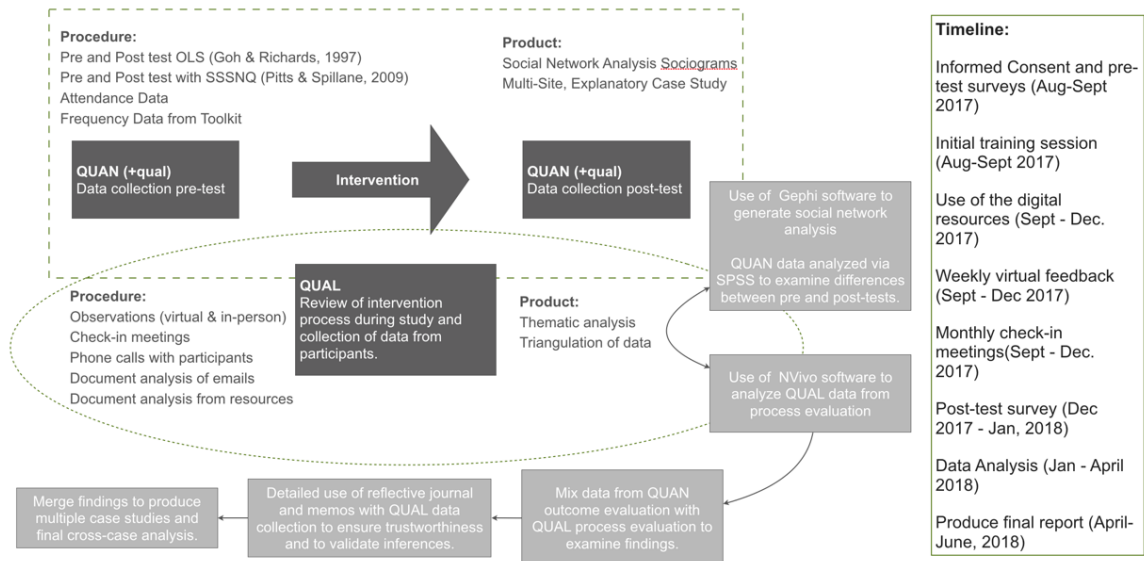
measures, as well as the procedures for data collection and analysis. Finally, the conclusion includes a discussion of the delimitations of the study.

### **Research Design**

A single data set would not have been sufficient to address the research questions given the complexity of the intervention as described by the logic model in Figure 4. Additionally, the process and outcome evaluations planned for this study required the use of both quantitative and qualitative research methods. Therefore, the researcher used a variant of an embedded mixed-methods design and conducted a multi-site, explanatory case study that included collection and analysis of both qualitative as well as quantitative data (Creswell & Plano Clark, 2011). Frequently employed to evaluate school innovations, multi-site explanatory case studies present rich descriptions and deep explanations on which to make inferences (Martinson & O'Brien, 2010).

Researchers often choose a mixed-methods embedded design when the research questions warrant multiple data sets as well as both quantitative and qualitative analysis (Creswell & Plano Clark, 2011). Further, an embedded design supports research programs where a secondary analysis informs the primary (Creswell & Plano Clark, 2011). In this intervention study, the secondary process evaluation assessed the fidelity of the program implementation and provided an explanation for the results of the outcome evaluation (see Figure 5 for Procedural Diagram of the Embedded Design). Since the process evaluation questions included the frequency and quality of interactions that participants had with the resources, the data informed the researcher's assessment of attrition as well as the outcome data. For example, the lack of responsiveness from the

participants and inconsistent frequency of interactions with the digital resources helped to explain the lack of statistical significance in the outcome evaluation.



*Figure 5.* Embedded Design Procedural Model. Procedures for an embedded mixed-methods design as defined by Creswell and Plano Clark (2011).

Embedded mixed-methods designs often occur within procedures such as social network analysis (Creswell & Plano Clark, 2011). Within the quantitative analysis of frequency, centrality, and density of interactions, qualitative data is embedded to capture the quality of those communication as well as an understanding of how those communication patterns may have formed (Borgatti & Cross, 2003; Penuel, Riel, Krause, & Frank, 2009; Pitts & Spillane, 2009). In this study, the rich descriptions captured within the mostly qualitative case studies further explain the patterns illustrated by the quantitative social network data captured via the pre and post-tests (Creswell & Plano Clark, 2011).

Unlike experimental or quasi experimental designs, the multi-site case study qualifies as a non-experiment that does not possess a treatment or control group (Shadish, Cook, & Campbell, 2002). Instead, pre and post-tests measured the outcomes, and rich

descriptions captured through the case studies corroborated those findings (Creswell & Plano Clark, 2011). The researcher assumed that each district might employ the resources differently and that modifications to the design of the intervention may be warranted to encourage participation within each site. Therefore, a constructivist worldview that examined reality within a specific setting allowed for a more inductive methodology and for the intervention to adapt to the differing political and cultural contexts within the districts (Creswell & Plano Clark, 2011). The process evaluation played a critical role in documenting these changes and explaining their effect on the outcomes of the study (Creswell & Plano Clark, 2011).

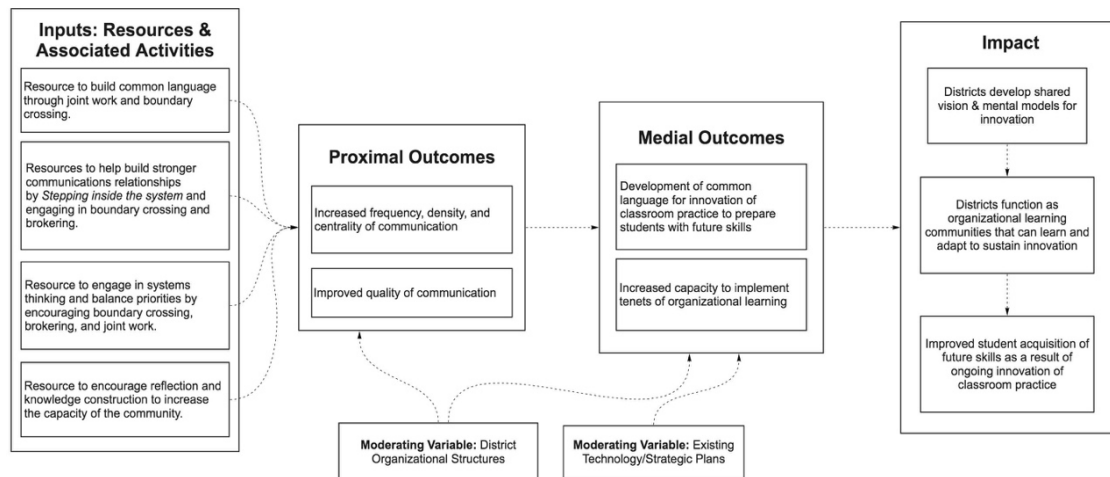
### **Outcome Evaluation**

Case studies provide detailed explanations to help understand complex phenomena (Martinson & O'Brien, 2010). In a mixed-methods case study, the qualitative strand produces descriptions of the intervention in context and allows the researcher to uncover new meaning through inductive approaches (Martinson & O'Brien, 2010). As such, the embedded qualitative strand provided data on which to better assess the intended outcomes (Shadish et al., 2002). This variant of an embedded design also permitted the use of multiple data sets to answer the separate research questions (Creswell & Plano Clark, 2011). Further, by embedding the strands within a multi-site design, the researcher gained additional insight through cross-case analysis as well as a more robust understanding of what happened in practice than what would have been achievable with a single case (Martinson & O'Brien, 2010).

Treatment theory describes how the inputs and associated activities of the intervention should logically have led to a series of outputs as well as the desired

outcomes (Leviton & Lipsey, 2007). The Theory of Treatment model (see Figure 6) illustrates the steps through which the treatment should have the desired effect and identifies the significant variables (Leviton & Lipsey, 2007).

**Goal:** improve communication, develop common language, and increase capacity for organizational learning



*Figure 6.* Theory of treatment model. Description of the causal relationships underlying the intervention program design.

The input of access to digital resources combined with the sociocultural activities of boundary crossing, brokering, and joint work (Honig, 2008; 2012; Honig & Rainey, 2014; Swinnerton, 2007) should have led to the proximal outcome of increased quantity and quality of communication. Had this outcome been achieved, it would have resulted in the development of common language and increased capacity for organizational learning — both measured as dependent variables in this study. Though beyond the scope of this evaluation, the long-term impact resulting from the proximal and medial outcomes would be the development of shared vision and mental models for innovation as districts function more as Organizational Learning Communities (OLCs) (Senge, 1990; 2006). Theoretically, functioning as an OLC would result in systemic change of classroom practice and greater student acquisition of knowledge economy skills.

The multi-site, mixed-methods, explanatory case study offers rich descriptions of the process of implementation to explain both the outcome measures and what occurred in practice (Martinson & O'Brien, 2010). This research design allowed the researcher to understand not only the data captured by the pre and post-test surveys but also how the participants reacted and engaged with the intervention. Though conclusions are descriptive and correlational in nature, the potential exists to make inferences that may guide future studies through inductive reasoning when looking both within and across the cases (Martinson & O'Brien, 2010).

### **Process Evaluation**

A secondary process evaluation was embedded within the primary outcome evaluation to monitor and document program implementation as well as elucidate the relationships between program elements and outcomes (Saunders, Evans, & Joshi, 2005). When used with an explanatory case study, a process evaluation describes the details of what occurred during the intervention (Martinson & O'Brien, 2015). Logic models then support the interpretation of the process evaluation data, especially when gathered from across multiple sites, and illustrate the connections between inputs, activities, outputs, and outcomes (Cooksy et al., 2001). As illustrated by the logic model for this intervention, the digital resources designed by the researcher existed as inputs to foster the desired activities. The outputs generated by completing those activities then served as data points for the process evaluation. For example, as participants used the digital resources, outputs of frequency, thoroughness, and context of use were analyzed both quantitatively and qualitatively to test the correlation between the activities and the desired outcomes (McLaughlin & Jordan, 2010).



Analysis of fidelity then substantiated the relationship between program inputs or activities and the intended outcomes of the implementation (Saunders et al., 2005). Fidelity can thus be defined as the degree to which the implementation of the intervention matched the intended design (O'Donnell, 2008). O'Donnell (2008) describes fidelity of implementation in terms of integrity – whether participants implement the procedures as designed; efficacy – the degree to which the implementation achieves the desired outcomes; and effectiveness – how well the intervention produces the predicted outcomes. Within the context of this study, fidelity was determined based on the integrity of the implementation of the resources, the efficacy of the program in increasing the quantity and quality of communication between stakeholders, and the effectiveness of the resources to ultimately support the development of common language and increase the districts' capacity for organizational learning.

According to both O'Donnell (2008) and Dusenbury, Brannigan, and Falco (2003), five criteria support the measurement of fidelity: adherence, exposure or dosage, quality of delivery, participant responsiveness, and program differentiation. With this intervention, adherence addressed how closely the program aligned to the inputs and activities described by the logic model (Dusenbury et al., 2003). In particular, the researcher documented changes to the design of the digital resources, modifications made to the initial training sessions, and adjustments made to the content, context, and timing of the check-in meetings as measures of adherence. The degree to which participants actively engaged in the desired activities as a result of using the resources served as a measure of responsiveness (Dusenbury et al., 2003). To determine how much of the program the participants actually received, the completeness or dosage (Dusenbury et al.,

2003) was measured based on the frequency with which the participants accessed and employed the resources as well as attended the face-to-face training session and meetings. Each of these specific fidelity indicators is further defined in the measures section.

## **Methodology**

### **Participants**

With a multi-site case study design, researchers frequently use purposive sampling strategies to specifically address the research questions (Martinson & O'Brien, 2010). The intervention study occurred in the three of the four, purposefully selected K-12 districts who participated in the chapter two needs assessment study: Bayview and Hilltop from North state, and Bridgetown from South state. Purposeful sampling permits the selection of groups of participants to establish comparisons between cases or subgroups (Teddlie & Yu, 2007). It also allows for the intentional selection of participants because of the existence of a central phenomenon (Creswell & Plano Clark, 2011). Within the context of this intervention study, each district presented unique traits that made them of interest to the researcher.

**Purposeful Sampling Rationale.** The researcher purposefully selected Bridgetown to participate in this intervention study because of its prior commitment to technology and innovation. Over the past several years, central office administrators have championed Bridgetown's involvement in the Office of Educational Technology's Future Ready initiative (U.S. Department of Education, 2016) and promoted the ideas of personalized learning and technology infusion. When approached about the intervention, the Superintendent, Assistant Superintendent, and Director of Educational Technology

embraced the idea of providing central office and building leaders with resources to improve communication, build language to describe innovation of classroom practice based on their Future Ready efforts, and increase the district's capacity for organizational learning.

Whereas Bridgetown is one of four regional districts in a suburban area of South state, Bayview is located just outside of a large urban area in North state — one of the highest performing states in the country. In 2011, Bayview garnered national attention as one of the first districts to embrace a 1:1 iPad program (one iPad per student). Both the Superintendent and Assistant Superintendent have been recognized as award-winning leaders from national publications, and several of the technology coaches have received recognition for their innovation. The researcher approached the Assistant Superintendent about participation in this intervention because of the district's reputation with technology. He committed to the program because he felt that the intervention might assist with two upcoming endeavors: a district capacity project and a new personalized learning initiative.

Located in a more rural area of North State, Hilltop has not only earned a reputation as one of the top performing districts in the state based on standardized test scores but also for its leadership and vision for innovation. The district has been featured in a Massive Open Online Course (MOOC) developed by edX and the Massachusetts Institute of Technology (MIT), and the previous Assistant Superintendent hired the researcher on several occasions to lead professional development sessions on topics such as design thinking, project based learning, and leading innovation for the instructional coordinators in the elementary and middle schools.

The researcher selected the participating districts using a theoretical sampling technique (Teddlie & Yu, 2007) to study the underlying causes and factors preventing the systemic spread of innovation throughout the ecosystem of a district despite prior efforts. Each district had previously established committees consisting of central office and building leaders to support innovation of classroom practice to prepare students for the knowledge economy. However, through initial conversations with the Superintendent or Assistant Superintendent, and then confirmed by the needs assessment, a common language to describe innovative classroom practice did not appear to exist throughout these contexts. Though this sampling method allows for in-depth analysis given the smaller sample sizes, the results of the intervention study may not be generalizable to broader populations (Teddlie & Yu, 2007) outside of small, suburban districts in the Northeastern region of the U.S.

**District Demographics.** As reported in the needs assessment, Bridgetown, Bayview, and Hilltop all described themselves as small (6-10 buildings), suburban districts. Using free or reduced price lunch as a proxy to identify socioeconomic status, approximately 31-50% of students receive this service in Bridgetown, and 11-30% of students qualify in Bayview. Hilltop possesses the most diversity within the district with free or reduced price lunch percentages ranging from less than 10% to 11-30% depending on the school. Whereas Bridgetown reported that less than 5% of their students could be considered English as a Second Language (ESL) learners, the two districts from the North state indicate that 6-10% or 11-20% of their students could be considered ESL learners depending on the school within the district.

The level of technology adoption also varied between these districts. Bridgetown has initiated a 1:1 technology plan, though only select grade levels have consistent access to devices. In Hilltop, students in the high school and middle schools have 1:1 programs, but the elementary schools have varying levels of access. Bayview gained national recognition for being one of the first districts in the country to adopt a 1:1 iPad program in 2012. Presently, all students in grades 1–12 have access to their own personal devices.

**Sample Demographics.** The sample for this intervention included both central office as well as building level administrators and educators. Within each district, the Superintendent, Assistant Superintendent, Director of Technology, Director of Educational Technology (if applicable), and other central office personnel who support teachers or instructional leadership participated along with the principals and assistant principals (if applicable) from each building. Depending on the organizational structure of the district, the coaches, coordinators, instructional technology specialists, library media specialists, and/or teacher-leadership team members were also recruited.

The Assistant Superintendents of each district recruited the participants whom they felt would be most relevant to this program based on their district's organizational structure. Bridgetown recruited their admin team as well as their Digital Learning Team (DLT) coaches ( $n=33$ ). Bayview included their admin council ( $n=38$ ), and Hilltop invited their district leadership team ( $n=41$ ). Though some members of the various administrative groups did not match the desired sample characteristics and included positions such as the Director of Human Resources or Director of Fine Arts, most of the sample did match the criteria of central office instructional leaders, principals, assistant or associate principals, and building leaders such as coaches, coordinators, or division

directors. Table 9 describes the general characteristics of the sample based on demographic data collected via the pre-test survey.

Table 9

*Intervention Sample Demographics*

District	Pre-Test	Post-Test
Bridgetown, South	<i>n</i> =33	<i>n</i> =18
Gender	87.8% female, 12.1% male	88.9% female, 11.1% male
Central Office	24%	27.8%
Principal/Assistant	33.3%	28.8%
Principal		
Coach	48.5%	44.4%
High School	24%	22%
Middle School	15%	17%
Elementary School	41%	39%
Bayview, North	<i>n</i> =38	<i>n</i> =10
Gender	63.2% female, 36.8% male	60% female, 40% male
Central Office	18.4%	30%
Principal/Assistant	28.9%	30%
Principal		
Coordinator/Coach	52.7%	40%
High School	31%	54%
Middle School	7%	8%
Elementary School	38%	31%
Hilltop, North	<i>n</i> =41	<i>n</i> =16
Gender	78.0% female, 19.5% male	81.3% female, 18.8% male
Central Office	14.6%	12.5%
Principal/Assistant	34.1%	18.8%
Principal		
Coordinator/Coach	46.4%	68.8%
High School	38%	26%
Middle School	26%	30%
Elementary School	38%	35%

Of note, within the total sample for the intervention ( $n=112$ ), the researcher only observed one individual who would not be identified as white or caucasian. Though race/ethnicity was not an identified factor, the researcher did note the lack of diversity amongst school and district leaders given the diversity of students within the districts. Particularly within the more senior leadership positions, such as the principals and those in the central office, most participants had been in the district for more than six years and had held their position for almost as long. Table 10 below shows the average tenure within each district.

Table 10

*Average Tenure from the Pre-Test Samples*

District	% with 6+ Years in the District	% with 6+ Years in Current Position	% with 6+ years of Teaching Experience	% with 6+ years of Leadership Experience
Bridgetown, South	60.6%	48.5%	93.9%	48.5%
Bayview, North	76.3%	34.3%	78.9%	44.8%
Hilltop, North	82.9%	56.1%	87.8%	73.1%

The next chapter includes more specific demographic information for each district. Given the large attrition rates that occurred across the districts (40-70%), the process evaluation includes the demographics of the sample as determined by the post-test survey and makes comparisons to the pre-test sample. The change in composition of the pre and post-test samples did affect the interpretation of the outcome data.

## Measures

**Outcome Measures.** According to Rossi, Lipsey, and Freeman (2004), measures of outcome refer not only to the level achieved at the conclusion of an intervention but also the measurable difference between the pre and post-test environments. The outcome evaluation included social network analysis, validated quantitative scales, and qualitative analysis of open-ended survey questions. An online survey administered before the start of the intervention, and at the conclusion, collected both quantitative and qualitative data. The secondary process evaluation supported and corroborated the analysis of the outcome data as described by the procedures for an embedded design (Creswell & Plano Clark, 2011). The Data Analysis Summary (Appendix E) aligns each variable and indicator to its associated research question.

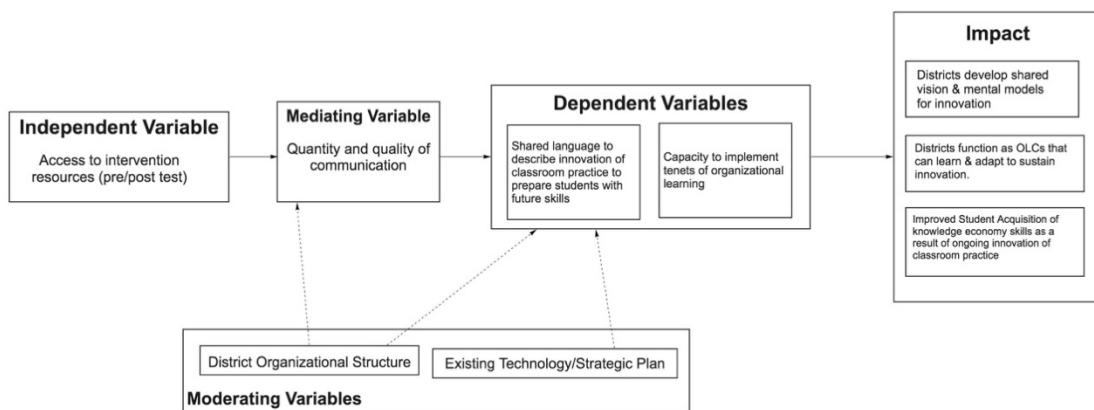
***Organizational Learning Capacity.*** Pre and post-test responses on the 21-item Organizational Learning Survey (OLS) quantitatively assessed the degree to which the intervention affected each district's capacity for organizational learning (Goh & Richards, 1997). To measure Senge's (1990) model of organizational learning, Goh and Richards (1997) designed their scale to determine the degree to which each district possesses a clear vision, a commitment to learning, tolerance of experimentation, dedication to transfer of knowledge, and an ability to collaborate. They tested this instrument with four organizations in Canada to determine its reliability and validity.

Though Goh and Richards (1997) began with a 55-item scale, their initial testing and factor analysis reduced the number of questions to 21 before retesting the scale against their predicted results. This testing combined with a thorough literature review indicates that the instrument possesses both face validity and construct validity. The



researchers statistically assessed the internal reliability of the scale and reported a Cronbach's alpha of 0.90. Finally, using a sample of graduate students ( $n=25$ ), the researchers used a test-retest method to further verify reliability and reported  $p<0.01$  after asking the group to complete the same survey after a delay of ten weeks (Goh & Richards, 1997). A more recent evaluation of the instrument (Goh et al., 2007) confirmed its reliability to measure the extent to which an organization adheres to the principles of organizational learning. This new study also included a sample of teachers from districts in Manitoba, Canada ( $n=41$ ) to verify that the scale does serve as a valid measure within an educational context. Cronbach's alpha confirmed the reliability of this instrument within the context of the intervention. For the 21 sub-scale items of the OLS Cronbach's alpha was 0.912.

***Effect of the Resources on Language.*** The second research questions examined how the language used by participants to support innovative classroom practice to prepare students with future skills for the knowledge economy might have changed because of the intervention. As illustrated by the causal model (Figure 7), common language serves as one of the dependent variables in this study.



**Figure 7.** Causal model. Illustration of the relationships between the variables to be measured in this intervention.

Open-ended survey questions on the pre and post-tests collected descriptions of participants' visions for innovation. Qualitative analysis of those statements looked for change between the pre and post-tests as well as references to knowledge economy skills (Levy & Murnane, 2013), 21st Century Skills (Soulé & Warrick, 2015), and keywords from the published district technology or strategic plans identified during the needs assessment.

***Impact of Sociocultural Activities on Communication.*** The researcher used social network analysis to answer the final research question and measure the medial variable of change in communication quantity and quality within the districts (Cross, Borgatti, & Parker, 2002). Through the online survey, each person in the district indicated those with whom they communicate and then characterized their relationship with that person. Though a single measure does not exist to quantify social interactions (Cross et al., 2002), software tools such as UCINET and Gephi have been validated to analyze social network data (Borgatti & Cross, 2003). These social network measures indicate the frequency of interactions, the density of connections within the network, and the centrality of communication around specific individuals (Daly et al., 2010; Daly & Finnigan, 2010; Umekubo et al., 2015). To measure the quality of interactions within a social network, Borgatti and Cross (2003) recommend a relational perspective that uses a Likert-scale with items that range from strongly agree to strongly disagree to assess the quality of communication based on knowledge, access, value, and cost. Though Borgatti and Cross (2003) only claim face validity for this measure, Penuel et al. (2009) extend those claims and recommend measuring both the density and the quality of social

interactions to see how communication supports helping and knowledge-seeking behaviors.

The social network analysis for this study, conducted as pre and post-tests using the School Staff Social Network Questionnaire (SSSNQ) from Pitts and Spillane (2009), intended to analyze the changes in structural connections and provide a visualization of the communication patterns (Daly et al., 2010). To create a valid scale for examining the communication patterns between school leaders, Pitts and Spillane (2009) developed and validated the SSSNQ. It specifically measures the advice seeking behaviors of individuals to identify the existence of social ties within school settings.

Two studies validated the survey instrument. The first occurred in 22 schools and used semi-structured interviews with a purposive sample from six of those schools (Pitts & Spillane, 2009). With the second study, the researchers conducted cognitive interviews while participants completed a survey. Pitts and Spillane (2009) then coded the data from the interviews to assess whether the responses matched the survey data. Qualitatively, the researchers determined that the SSSNQ did present an accurate representation of advice seeking while also revealing the informal leadership structures within the organization (Pitts & Spillane, 2009). Cronbach's alpha confirmed the reliability of this instrument within the context of the intervention. Cronbach's alpha for the 20 sub-scale items of the SSSNQ related to leadership was 0.962.

Additionally, the researcher recognized that the existing organizational structures of the districts may moderate the effect of this intervention. During the needs assessment, interviews with central office stakeholders revealed that each district possessed different organizational characteristics: the availability of dedicated

instructional coaches, regularly scheduled collaboration times, and varying roles and responsibilities for different building leaders. Since these structures influence communication patterns, they are addressed in the case studies as a moderating variable to offer additional insights when comparing the pre and post-test data.

**Process Measures.** A process evaluation determines whether the researcher executed the program as intended by the initial design (Rossi et al., 2004). By embedding this secondary study within the primary outcome evaluation (Creswell & Plano Clark, 2011), the researcher could draw stronger conclusions based on the fidelity of implementation (O'Donnell, 2008). Ensuring the fidelity of a program increases the potential for generalizability and improves the internal and external validity of the study (Holliday, 2014). The Data Analysis Summary (Appendix E) presents the specific measures and indicators used to respond to each of the evaluation questions, and the narrative below elaborates on how the researcher used these indicators to monitor the dose, responsiveness, and adherence of the intervention.

**Frequency of Use.** The researcher measured the frequency with which the participants used the different resources to address the hypothesis that regular use of the resources to engage in the sociocultural activities should positively correlate to increased quantity and quality of communication. Two indicators of frequency could be measured from the digital resources. First, the researcher tracked the number of interactions that participants had with each resource on a weekly basis as recorded by the activity logs within the digital resources. Weekly access of the resources would have indicated high fidelity. Participants only accessing the resources when explicitly directed during the initial training or face-to-face meetings intimated low fidelity. Sporadic use beyond those

face-to-face gatherings indicated moderate fidelity. As a second indicator, the researcher created tracking links to count the number of unique “clicks” made by participants on the web-based hyperlinks to access the resources. A majority of the sample within each district clicking on each link would be an indicator of high fidelity. Half of the sample indicated a moderate level of fidelity, and fewer than two clicks per week was a sign of low fidelity. The researcher monitored these tracking links on a weekly basis.

Attendance at the initial training session also served as an indicator of dose. The researcher used the training to provide an introduction to the intervention program and engage participants in an activity to model the intended use of the resources. Participants attending the session and completing the activity served as an indication of high fidelity. Low fidelity would be failure to attend — a reality in some of the sites given challenges of scheduling. However, participants who attended but did not actively participate served as an indication of a moderate level of fidelity. The researcher used a spreadsheet to record attendance and documented the inputs into the resources during the activity as an indicator of participation.

***Context of Use to Engage in Conversations.*** According to Nelson, Cordray, Hulleman, Darrow, and Sommer (2012), fidelity first links core components of an intervention to the outcomes and then measures the extent to which they might have been implemented. To better understand the effect of the intervention activities on the process of developing common language, the researcher monitored how the participants used the resources as well as where (e.g. faculty meeting, face-to-face meeting with the researcher, during a teacher observation, etc.) and with whom. Therefore, the second evaluation question examines the context of participants’ communication and asks how they used the

individual tools to engage in conversations about innovation with members from different stakeholder groups.

During the initial training session, participants learned about the program, received instructions for accessing the resources, and completed an initial activity. The training session intended to help participants develop both a technical and a conceptual understanding of the resources. To collect evidence of participation, the researcher maintained a spreadsheet to track attendance as well as use of the individual resources employed during the introductory activity. Elements of high fidelity not only included attendance at the training but also the participants' ability to access the resources and complete the activities. Failure to attend, attending but without accessing the resources, or attending but not engaging in the activity served as indications of low fidelity.

To determine how participants use the specific resources independently in practice, the researcher monitored and analyzed the information entered into the digital resources on a weekly basis. The researcher developed a series of codes (see qualitative code book in Appendix F) to analyze this information. During the scheduled, face-to-face check-in meetings, semi-structured focus groups intended to confirm the analysis of the outputs as well as ensure trustworthiness through member checking. High fidelity could be characterized by thoughtful resource selection to meet a specific need, to engage in a desired form of communication, or to address a distinct concern. Participants using a limited selection of resources, only employing the resources during the initial training and face-to-face meetings, or not using the resources at all constitutes low fidelity.

Finally, using the resources to engage in the desired sociocultural activities represents an indicator of responsiveness or participant engagement. According to the

theory of treatment, these activities should lead to increased quantity and quality of communication as well as the development of common language. The researcher collected data on a weekly basis by monitoring the information entered into the digital resources and then coding the information based on the tenets of joint work, boundary crossing, and brokering (Honig, 2008; Honig & Rainey, 2014; Swinnerton, 2007). Adding details about conversations and interactions into the tools (e.g. thoroughly filling them in and adding notes in the reflection spaces) as well as providing anecdotal evidence of using the tools with different stakeholders during check-in meetings would have indicated high fidelity. Low fidelity could be described as non-use of the resources, lack of details entered into the tools, or using the tools solely during the face-to-face meetings rather than in interactions with colleagues.

***Effectiveness of the Toolkit Across Districts.*** Oftentimes, interventions fail to account for the variability of educational contexts (Bryk et al., 2015). In this study, the researcher intended to implement the same resources in three districts possessing similar geographic and demographic characteristics, and yet distinctly different cultures. To answer this third evaluation question, the researcher examined the data collected during the process evaluation to determine how the different districts used the resources. The sub-questions examined the effect of two moderating variables on how the districts participated in the intervention: the existing technology or strategic plans and the organizational structures of the districts.

During the needs assessment, the researcher conducted a qualitative analysis of each district's published technology or strategic plan. Common themes and alignment with outside organizations like the *Partnership for 21st Century Skills* or *Future Ready*

initiative emerged as indicators of the current thinking within each district. When studied in conjunction with the quantitative data collected from the *21st Century Skills/Deeper Learning* element of the *Curriculum, Instruction, and Assessment* sub scale of the *Future Ready Dashboard* (Alliance for Education, 2015a), it became apparent that each district already possessed different perceptions about the role of technology in classroom practice as well as the concept of innovation. As will be discussed in the next chapter, though the initial perceptions did not necessarily moderate the effects of the intervention, they did shape the language used when discussing innovation and the topics of conversation.

Interviews with key stakeholders during the needs assessment and evaluation planning meetings revealed distinct differences in organizational structure within each district. First, both districts from the North state maintain formal coaching programs consisting of full-time individuals dedicated to providing teachers with instructional support. These coaches (sometimes referred to as coordinators) assumed much of the responsibility for instructional leadership in their buildings or divisions intimating that they already play key roles as boundary crossers or brokers {Honig:2008} between teachers and administrators. However, though Bridgetown implemented a new program during the time of the intervention to create Digital Learning Team (DLT) coaches as a stipend position, the classroom teachers appointed to these roles did not received any formal acknowledgement of their position, additional training, or dedicated time to work with their colleagues. Though the existence of these disparate structures and the communication that occurred within them did not necessarily moderate the effects of the intervention, they could threaten the fidelity of the study if not taken into account. Communication patterns resulting from the efforts of the coaches could mirror or enhance



the effects of the intervention. These moderating variables are further discussed within the case studies in the next chapter.

***Adherence to the Design of the Program.*** Fidelity encompasses both the extent to which the core components of the program compare to the intended design and the actual implementation of the program as a whole (Nelson et al., 2012). The final evaluation question addresses the extent to which the implementation of the program adheres to the original design. Using a reflective journal as the primary data source, the researcher documented the following four indicators to ensure adherence.

First, the researcher determined that all districts received the initial training session and noted any discrepancies in delivery or structure. For example, to accommodate the demands of the unions in Bridgetown, the DLT coaches received their training separate from the admin council. Next, the researcher examined the implementation of the actual resources and noted any changes made to the individual tools by request of the districts such as the addition of a printable version in Bayview and Hilltop. The researcher documented the virtual check-ins and monitoring of the digital resources in her journal as well as the frequency of participant interactions and the contents of all electronic communication including phone calls, emails, and comments left within the digital resources. Finally, an attendance sheet, the researcher's journal, and audio recordings provided detailed descriptions of the face-to-face check-in meetings as they evolved in structure and length over the course of the intervention in response to the needs of the individual districts.

## **Procedure**

An embedded mixed-methods design follows a specific procedure. First, analysis of the experiment design and research questions should reveal a need for both qualitative and quantitative strands, multiple data sets to answer the research questions, and a secondary study embedded within the primary evaluation (Creswell & Plano Clark, 2011). Next, a sampling procedure that aligns to the embedded design should be conducted (Creswell & Plano Clark, 2011). As previously described in the participants section, the researcher used a purposive sampling strategy to specifically address the research questions (Martinson & O'Brien, 2010) and selected the sites for the case study based on the existence of a central phenomenon (Creswell & Plano Clark, 2011). Permission should then be obtained before beginning the study. During the needs assessment, the researcher gained permission to conduct the study within the participating districts. However, before beginning the intervention, the researcher also acquired informed consent from individual participants. After completing those steps, the procedure of the intervention could begin (Creswell & Plano Clark, 2011).

The intervention itself took place from August – December 2017. During that time, participants completed a pre-test followed by an initial training session before interacting with the provided resources in the context of their regular work. Though participants received virtual feedback from the researcher throughout the process, they also met in-person on multiple occasions. Given the scheduling constraints and existing organizational structures of the districts, these face-to-face meetings did not occur consistently across districts or adhere to the initial design of the intervention. The individual cases presented in the next chapter detail the differences in each district.

Finally, a post-test concluded the intervention. The timeline presented in Table 11 below provides a general overview of the intervention.

Table 11

*Intervention Timeline*

Intervention Activity	Participants	Timeline
Consent form and pre-test survey emailed to participants	Central office and building stakeholders	To be completed before the training session
Initial training session	Central office and building stakeholders	August 2017 during back-to-school professional development time and September 2017 for the DLT Coaches in Bridgetown.
Use of the digital resources	Central office and building stakeholders	From the training until the December holiday break
Face-to-face meetings/semi-structured focus groups	Central office and building stakeholders	Once per month between September–December 2017 (maximum of 4 times per group per district)
Post-test survey	Central office and building stakeholders	Administered before the start of the December holiday break and closed in mid-February.
Semi-structured interviews	Central office stakeholders and/or Principals	As needed during the intervention
Emails and Phone Calls	Central office stakeholders and/or building leaders	During the intervention when initiated by the participant

Throughout the intervention, and after completion of data collection, the researcher analyzed the process data collected during the training and check-in meetings as well as from the digital resources. The researcher used this data to document and measure fidelity of implementation. In accordance with the procedures of a mixed-methods, multi-site case study, the researcher embedded the process data within the outcome data to build rich descriptions for each site and then triangulate findings across them (Creswell & Plano Clark, 2011; Martinson & O'Brien, 2010).

**Intervention Components.** As described in chapter three, the primary component of the intervention was a set of digital resources. The researcher intended for participants to use these resources in their regular interactions with other members in the district to improve communication, build common language, and increase their districts' capacity for organizational learning. Before gaining access to the resources, participants completed an online survey that included both the informed consent as well as a pre-test. Most participants also attended an initial training session and engaged in a maximum of four face-to-face meetings. Throughout the intervention, participants received virtual feedback from the researcher in the form of a weekly email announcement as well as digital comments left in the resources. The narrative below describes these intervention components in detail. Data collection and analysis of pre and post-test data as well as the indicators of fidelity are discussed in a later section.

**Training.** An initial training initiated the intervention and primarily occurred during the district's back-to-school leadership retreat or professional development day. However, due to scheduling constraints and demands by the teachers' union, the DLT coaches in Bridgetown received their training during an after-school session in

September. During this training, participants gained an overview of the program, learned to access the digital resources, and completed an introductory activity using the resources. Each session began with a similar script but varied slightly per direction from district leadership. All discrepancies will be discussed in the individual cases presented in the next chapter.

***Face-to-Face Meetings.*** The researcher met with participants throughout the course of the intervention. Though the intended design scheduled these to occur for 30-minutes, one time per month, from September – December, as will be discussed in the following chapter, each district adopted a different schedule. These face-to-face meetings served two purposes. First, the meetings allowed participants to seek clarification about the resources, engage in conversation with their colleagues about their experiences using them, and provide feedback to the researcher. Second, they allowed the researcher to conduct observations and semi-structured focus groups. These opportunities for triangulation and member reflections supported the researcher’s ability to build thick descriptions for the case studies (Tracy, 2010).

***Digital Resources and Virtual Check-Ins.*** The digital resources supported both synchronous as well as asynchronous communication and collaboration. Throughout the intervention, participants could interact with the resources independently in their own designated space as well as view and comment on the work of their colleagues. Further, the researcher monitored all participant interactions in the tools, provided feedback to individuals in the form of digital comments, and sent electronic communication to each group of participants. This virtual feedback occurred on a weekly basis as a component

of the process evaluation. The following sections present complete details of the data collection and data analysis procedures.

**Data Collection.** Data collection occurred before, during, and after the intervention to answer the outcome and process evaluation questions. With an embedded design, the timing of data collection and analysis plays a critical role as the secondary data supports the analysis of the primary data (Creswell & Plano Clark, 2011). In this study, the outcome evaluation occurred as pre and post-tests while the embedded process evaluation happened during the course of the intervention. The procedural diagram (Figure 5) illustrated how the qualitative process evaluation was embedded within the primarily quantitative outcome study. As explained in the sections below, data collection for both the outcome and process evaluations included quantitative and qualitative data to answer the research questions.

***Outcome Evaluation Data Collection.*** The outcome evaluation served as the primary study in this embedded design. Participants from each district completed pre and post-tests by responding to surveys administered via Qualtrics – an online survey platform. Links to each district’s pre and post-test surveys were disseminated via email, and all data has been secured in a password protected account.

Both the pre and post-test surveys collected qualitative and quantitative data. The 21-item Organizational Learning Survey (OLS) (Goh & Richards, 1997) asked participants to respond to Likert-scale questions regarding their capacity to implement the tenets of organizational learning (dependent variable). To address the second research question, how the language used by participants to describe innovation changed during the intervention, an open-response item asked participants to define their vision for

innovation of classroom practice to prepare students with future skills. Finally, survey items from the School Staff Social Network Questionnaire (SSSNQ) (Pitts & Spillane, 2009) elicited the quantitative data required to conduct a social network analysis. Responses to Likert-scale questions not only collected information about the density and centrality of the social networks but also the perceived quality of those interactions. The researcher used that data to address the third research question and examine how engaging in the sociocultural activities with the digital resources affected the quantity and quality of communication (mediating variable) between the participants within their districts.

After participants completed the pre and post-tests, the researcher downloaded all data for analysis. With the social network data, the researcher downloaded the data into Excel for formatting and then imported it into a social network visualization application (Gephi 0.9.2) for analysis. The remainder of the quantitative data was imported into a statistical software package (SPSS 24.0). All data remains secured in password protected accounts.

***Process Evaluation Data Collection.*** The researcher embedded a robust process evaluation within the outcome evaluation to create a narrative around the context of the intervention (Creswell & Plano Clark, 2011). The quantitative and qualitative data allowed the researcher to build the rich descriptions for the case studies presented in the next chapter as well as to explain the results of the outcome evaluation. As shown in the table below, a number of instruments collected data throughout this intervention.

Table 12

*Data Collection Instruments*

Data Collection Instrument	Description of Data Collected
Pretest Survey (Qualtrics)	Quantitative: responses to the OLS and SSSNQ  Qualitative: open-response items to describe vision for innovation of classroom practice with technology
Attendance Spreadsheet	Name of each participant and attendance at the initial training as well as face-to-face meetings
Digital Resources Link Tracking Dashboard	Quantitative: Number of times that participants from each district clicked on a tracking link to the resources or interacted within the resources captured per week  Qualitative: context descriptions and summaries about each output generated by participants using the resources
Individual digital resources	Quantitative: frequency of access by participant, number of outputs per participant  Qualitative: document analysis of information entered into the tools, analysis of comments provided within the tools
Face-to-Face Meeting audio	Qualitative: audio captured during each focus group or interview transcribed and coded
Reflective Journal	Qualitative: detailed notes captured from phone calls with participants as well as email threads from participants analyzed and coded
Posttest Survey (Qualtrics)	Quantitative: responses to the OLS and SSSNQ  Qualitative: open-response items to describe vision for innovation of classroom practice with technology

First, the frequency with which participants used the digital resources served as an indicator of dose. Each district accessed the digital resources via a custom web link. By using the bit.ly service to create this link, the researcher tracked how often participants



from each district accessed the resources. Additionally, because each tool was created within Google Drive, the researcher leveraged that service's activity log to determine when each participant used the specific tools. Finally, the researcher recorded attendance at both the training session and every face-to-face meeting in a spreadsheet.

Next, information that participants entered into the individual resources contributed to the researcher's understanding of participant engagement or responsiveness. Within the case studies, the researcher provides rich descriptions of how participants used the tools either as individuals or in groups. The notes, reflections, and information entered into the different resources supplied the data for qualitative analysis. Additionally, notes from phone calls and emails entered into the researcher's reflective journal provided additional data for analysis. Much of this information was triangulated with data collected during the face-to-face sessions.

As a final measure of fidelity, the researcher determined how closely the implementation adhered to the design. The spreadsheet used to track attendance at the training and face-to-face meetings indicated whether the researcher conducted all of the sessions as planned. To record any changes made to the resources as well as to document all comments, feedback, and interactions that occurred during the virtual check-ins, the researcher maintained a reflective journal. Ultimately, as described in the next section, this process evaluation supported the findings of the outcome study.

**Data Analysis.** In accordance with the procedures defined for an embedded mixed-methods design, mixing of the quantitative and qualitative strands occurs at the design level (Creswell & Plano Clark, 2011). As described in the previous section, outcome data collection occurred before and after the intervention in the form of pre and

post-tests. Data collected as part of the process evaluation was analyzed throughout the study (Creswell & Plano Clark, 2011). The remainder of this chapter discusses the data analysis for the outcome and process evaluations.

***Outcome Evaluation Analysis.*** The outcome evaluation used pre and post-test surveys to quantitatively and qualitatively measure the effect of the intervention on the mediating and dependent variables. Before conducting the outcome evaluation, the researcher first determined whether enough statistical power would be available to detect a significant statistical change and avoid Type I and Type II errors (Lipsey, 1998). Determining the requisite effect size and sample size to achieve statistical power supports the ability to make causal inferences (Shadish et al., 2002).

For this intervention, determining the effect size required an actuarial approach using related literature (Lipsey, 1998). Because researchers present the results of social network analysis as a comparison of maps rather than mean differences, and the OLS (Goh & Richards, 1997) had not previously been used in intervention studies, two programs that addressed the acquisition of Technological Pedagogical Content Knowledge (TPACK) (Mishra & Koehler, 2006) in an online environment informed the determination of effect size. As mentioned in the previous chapter, the *Technology for the Purpose Of...* resource was designed based on the trudacot protocol (McLeod, 2015) which incorporated the tenets of Mishra and Koehler's (2006) TPACK framework.

In a study of online professional development to improve TPACK, Rienties et al. (2013) reported a Cohen's d-value of .38 based on pre and post-test scores with a single sample, indicating a relatively low effect size. Power analysis using the G\*Power software tool revealed that with a moderate statistical power value of .80 and an alpha

level of .05, the desired sample size to achieve a similar level of statistical power for this intervention would be 45. In a separate study, Ke and Hsu (2015) compared pre and post-test TPACK scores after teachers completed mobile artifact review or design. Power analysis calculations based on the reported means and standard deviations revealed an effect size of .83 and recommended a sample of only 11. Across the three districts, a total sample of  $n=112$  participated in the pre-test for this intervention. Even though the post-test sample decreased dramatically ( $n=44$ ), based on the literature, an effect size ranging from .30-.50 and a statistical power of .80-.90 should be sufficient to detect a statistical significance between the pre and post-test data.

*Organizational Learning Capacity.* The researcher measured the dependent variable, the districts' capacity for organizational learning, via pre and post-test responses to the OLS (Goh & Richards, 1997). According to Goh and Richards (1997), descriptive statistics can be used to compare mean scores on the individual sub scales as well as the total scale. A later analysis of the OLS instrument (Goh et al., 2007) indicated that the sub scales on the OLS highly correlated to the overall construct measured by the scale and could thus be examined as a single scale. However, Goh et al. (2007) also indicated that researchers may find value in examining the specific sub-constructs constituted by the sub scales as they represent different tenets of learning organizations. Therefore, the researcher conducted the following analyses using a statistical package (SPSS 24.0).

The researcher exported the pre and post-test data out of the online survey platform (Qualtrics), imported it into SPSS, and combined the pre and post-test data sets into one file per district for analysis. Following the recommendations from Goh and Richards (1997), new variables for each sub scale of the OLS as well as the instrument as

a whole were calculated as mean scores. To examine the differences between the pre and post-test environments, the researcher first explored potential differences between the mean scores by generating box plots of the data as well as frequency tables of central tendency. According to Schutt (2015), displaying variation in data often serves as the first step in statistical analysis, and generating graphs such as box plots can facilitate that interpretation since they graphically illustrate the variability of scores around the median as well as the presence of outliers (Lewandowski, Lewandowski, & Bolt, 2010).

The researcher then checked the normality of the data distributions by running a Shapiro-Wilk test ( $p < .05$ ) as well as calculating the skewness and kurtosis of each sub scale variable plus the combined variable for the overall instrument. Additionally, the researcher conducted Levene's test of homogeneity of variance ( $p < .05$ ). Finally, the researcher used a non-parametric Wilcoxon Signed Rank Test to determine whether the null hypothesis could be rejected when comparing the pre and post-test scores on the composite OLS variable. The researcher chose this nonparametric test since the data collected via the post-tests violated multiple assumptions of a paired samples t-test (Salkind, 2014).

*Language to Describe Innovation.* Though the researcher intended to examine changes in language used to describe innovation of classroom practice with technology through qualitative analysis of statements captured through the open response survey items on the pre and post-tests, the lack of participant responses made this a difficult endeavor. Using codes based on the operationalization of knowledge economy skills (Levy & Murnane, 2013), 21st Century Skills (Soulé & Warrick, 2015), and keywords from the district technology/strategic plans, the researcher intended to analyze the

information for alignment as well as for consistency within the districts. However, given the lack of data from this single survey item, the researcher decided to instead focus on the qualitative data collected during the process evaluation.

*Social Network Analysis.* To answer the final research question and to determine any change in quantity and quality of communication (mediating variable), the researcher used the School Staff Social Network Questionnaire (SSSNQ) (Pitts & Spillane, 2009). This survey instrument captured data related to the direction, quality, and quantity of communication occurring within each district by asking participants to describe their advice seeking behavior using a series of Likert-scale questions (Pitts & Spillane, 2009). After downloading the survey data into Excel, the researcher created a data table to label the nodes in the network using the participants' job titles as well as a table that described the edges of the network. This edges table identified the source of the advice seeking, the target (e.g. the person to whom the source sought advice), and the weight of the interaction. One of the five-item Likert-scale questions asked participants to rate the level of influence of the advice with one being *Not at All Influential* and five being *Very Influential*. The researcher used those Likert-scale scores to determine the edge weights (the thickness of the lines) within the network and then imported the data tables into Gephi 0.9.2, a software package designed to create sociograms from social network data.

After importing the data into Gephi, the researcher conducted the following analysis to generate the sociograms. First, during import, the researcher set the edges as "directed" to show the directionality of each interaction and the weight as "integer" to maintain the values from the Likert-scales. Then, the researcher used the Force Atlas algorithm (Gephi, n.d.) to determine the layout of the sociogram. This is a force-based

algorithm where the nodes with the strongest connections appear closer to each other, and those with a weaker connection get pushed further apart. To determine the strength of the connection, the software used the values entered as edge weights. These values came from the Likert-scale items on the SSSNQ (Pitts & Spillane, 2009) that asked participants to rate the level of influence of each interaction.

When configuring the layout algorithm, the researcher used the following settings per recommendations from Gephi (n.d.):

- Autostab strength = 2,000
- Repulsion strength = 2,000
- Attraction strength = 1
- Gravity = 10
- Attraction Distribution = checked
- Adjust by Sizes = checked

Once the layout had been established, the researcher used Gephi to calculate the statistics for average degree, average path length, and modularity class — a statistical measure to calculate the presence of communities based on the patterns of interactions (Gephi, n.d.). To generate the final sociogram, the researcher used the calculated statistics to determine elements of the visual layout. The researcher ranked edges by weight — the thickness of the lines connecting the nodes corresponded to the Likert-scale responses about the influence of each interaction. For example, a *Very Influential* connection appears as a thick link, and an interaction that is *Not at All Influential* appears as a thin line. Node size indicates the betweenness centrality of the individual. The more connections that an individual may have, the larger they appear. To see the different

statistical communities detected by the modularity class algorithm, the researcher then partitioned the node colors by that statistical value. This analysis occurred with the pre-test and post-test social network data, allowing the researcher to make comparisons within each district.

Given the attrition between the pre and post-test data, the researcher also generated sociograms using the pre-test data after removing those participants who did not complete the post-test. Though these new graphs did not show the entire network, they did create a more realistic image on which to make comparisons. Qualitative data captured through the process evaluation supported the interpretation of these sociograms and will be described in the next chapter. Additionally, the researcher analyzed data captured via a Likert-scale question about overall satisfaction with the quality of available advice using descriptive statistics and then triangulated those findings with the sociograms to complete the analysis.

***Process Evaluation Analysis.*** Evaluating the process of how participants used the resources to increase the quantity and quality of their communication across the layers of the district further explained the connections between the proximal and medial outcomes. As the secondary study in an embedded design, analysis of the process evaluation supported the ability to make inferences about the outcome evaluation (Creswell & Plano Clark, 2011) and determined whether the implementation of the program matched the intended design (Rossi et al., 2004). Following the criteria provided by Dusenbury et al. (2003) and O'Donnell (2008), the process evaluation measured indicators associated with frequency or dosage, adherence, and participant responsiveness. The qualitative data captured throughout the process also provided the

details to support the rich descriptions presented by the multiple case studies (Martinson & O'Brien, 2010).

To measure the dose of the intervention, the researcher counted frequency of interactions. Participant attendance at the training and face-to-face sessions, as well as the activity logs generated by bit.ly and Google Drive as participants accessed the resources, provided the data set for a frequency count. The researcher compiled this data in a spreadsheet to count the number of interactions that participants within each district had with the digital resources and the intervention program. Additionally, the researcher calculated the frequency with which participants accessed each individual resource. Comparison of these numbers, combined with attrition rates from the pre to post-tests, allowed for a cross-district analysis of participation rates.

Given the variation both within and between the districts, the researcher next examined the contexts in which the participants used the different tools. Qualitative analysis of the tool outputs, semi-structured focus groups conducted during the check-in meetings, and notes captured from phone calls as well as emails triangulated findings and served as an indicator of participants' conceptual understanding of the tools. The researcher presented accounts of the frequency of tool use as well as how participants used the tools, with whom, and in what context to build rich descriptions of each case and then make comparisons across the cases. Because each district interacted with the digital resources in very different ways, and required distinct modifications to encourage responsiveness, the case studies present rich descriptions of what occurred in context and also support discussion of the different implementations across sites. In the next section, the researcher describes the qualitative analysis process.



**Qualitative Analysis.** According to Saldana (2009), qualitative analysis occurs in cycles. The first cycle includes the initial coding and the establishment of themes while the second results in analysis and synthesis (Saldana, 2009). Though the researcher examined process data throughout the intervention and maintained detailed records through the digital resources as well as a reflective journal per the recommendation of Nastasi and Schensul (2005), upon completion of the program that data was converted into text documents or PDF files and imported into NVivo for analysis. The total data set included the researcher's journal entries, email threads, phone call notes, notes from face-to-face meetings, the outputs of the individual resources, the comments exported out of the resources, as well as transcripts of all recorded audio. While importing each of these data sources into NVivo, the researcher coded them by attribute (Saldana, 2009). These codes included the associated district, the type of data (e.g. face-to-face meeting notes, transcript, journal entry), and — if applicable — the person with whom the interaction occurred (see Appendix F for qualitative code book).

Based on the researcher's reflections during the intervention as well as initial observations while importing the data into NVivo, the researcher then created a codebook that contained indicators of fidelity (e.g. adherence or responsiveness), the individual research questions (e.g. EQ1 - frequency), the names of the specific digital resources (e.g. Polarity Map), as well as key terms from the literature associated with the following constructs: TPACK (e.g. tech tool focus) (Mishra & Koehler, 2006), Power (e.g. political or structural) (Bolman & Deal, 2008), and the sociocultural activities (e.g. joint work or brokering) (Honig, 2008;2012; Honig & Rainey, 2014; Swinnerton, 2007). With the codebook (See Appendix F) established, the researcher began a second round of

descriptive coding to identify topics within the data (Saldana, 2009). During this second round, the researcher applied these provisional codes to the data and also documented new codes as they emerged. When multiple codes could be applied to a single data point, the researcher used annotations in NVivo to document the rationale for the simultaneous coding (Miles & Huberman, 1994 as cited in Saldana, 2009).

After this second round of coding, the researcher organized emergent codes into new themes or added them to existing ones. For example, *coherence* and *time* became associated with the theme of *Power* based on analysis of policy literature (Hess, 2008; Willower, 1991). Similarly, in addition to the individual activities of joint work, boundary-spanning, and brokering (Daly & Finnigan, 2010; Honig, 2008; Honig, 2012; Honig & Rainey, 2014; Swinnerton, 2007), the researcher included the emergent code *protocol* within the theme of *sociocultural activities* because of comments from participants that they used the resources as a verbal protocol to engage in the sociocultural activities. The researcher then completed a third round of descriptive coding before reaching saturation (Onwuegbuzie & Leech, 2006).

Throughout the process, analytic memos and annotations within NVivo as well as the reflective journal documented code choices, emergent patterns and themes, problems with the study, and notes for future directions (Saldana, 2009). After completing this first cycle of coding, per the recommendation of Saldana (2009), a second cycle of coding analyzed themes as well as quantitized (Teddlie & Tashakkori, 2003) coding patterns to make comparisons across districts. The next section of this chapter addresses how the researcher ensured the trustworthiness of the qualitative analysis and mixed the data.

**Trustworthiness.** The researcher established trustworthiness through a rigorous approach that included sincerity, transparency, and self-reflexivity (Tracy, 2010). This included using multiple sources to inform the coding of the qualitative data, maintaining a reflective journal, and incorporating the quantitative data as well as the data collected across the different sites to triangulate findings. Within the structure of the embedded design, data collected during the process evaluation served to crystallize findings from the outcome evaluation as the researcher employed multiple methods — semi-structured focus groups, interviews, analysis of the resources, and quantitative data — to deeply engage in the study (Tracy, 2010).

Because the researcher also played the role of evaluator, she maintained a detailed reflective journal to mitigate any personal bias, documenting all decisions, interactions, and conversations for review (Nastasi & Schensul, 2005). The researcher also used audio recording as well as detailed transcripts to ensure the trustworthiness of the qualitative data. Though the researcher had no formal role or capacity within any of the districts, and thus did not represent an authority figure, she had previously interacted with various stakeholders and members in her professional context. Those prior experiences did introduce bias into the study as it established a pre-existing condition of trust with certain groups of participants. The researcher monitored and noted her prior relationships with participants throughout the intervention to reduce the potential for any bias.

To ensure the trustworthiness of the qualitative analysis, the researcher used several techniques (Nastasi & Schensul, 2005). First, the prolonged engagement with each site and persistent observation that occurred within the digital resources as well as in the face-to-face meetings added to the depth of the investigation and resulted in thick

descriptions for each case presented in the next chapter. Next, the researcher triangulated qualitative data with multiple sources. Finally, a reflexive journal documented thinking and also created an audit trail for systematic review of the analysis process (Nastasi & Schensul, 2005; Tracy, 2010).

**Data Mixing.** According to Creswell and Plano Clark (2011), with an embedded design, the quantitative and qualitative data can be collected sequentially or concurrently. When using a multi-site case study that collects quantitative and qualitative data concurrently as a variant on an embedded design, one procedure — such as the process evaluation — becomes embedded within another — in this case, the outcome evaluation (Creswell and Plano Clark, 2011). As described by the procedural diagram of the research design (Figure 5), the predominately qualitative process evaluation was embedded within the QUAN(+qual) outcome evaluation that occurred as pre and post-tests. Therefore, the researcher used a chronological approach to mix the data during analysis. Throughout the analysis, the researcher examined the relationship between the evaluation and outcome data, employing the secondary process evaluation to understand the results of the primary outcome study. Not only did the researcher make pre and post-test comparisons within each district, but she also examined differences across the case studies.

First, the researcher analyzed the quantitative pre-test data captured through the OLS (Goh & Richards, 1997) and the SSSNQ (Pitts & Spillane, 2009). Then, the researcher analyzed each fidelity indicator which included items such as participant attendance, frequency of interactions with the digital resources, as well as qualitative notes about adherence entered into the researcher's journal. All of the outputs from the

digital resources as well as transcripts from interviews and the face-to-face check-in meetings were then qualitatively analyzed to examine the fidelity of implementation and then compared to the initial quantitative analysis from the pre-test survey.

After completing multiple cycles of qualitative coding as well as a preliminary analysis of the qualitative data, the researcher analyzed the post-test data from the SSSNQ (Pitts & Spillane, 2009) and created the sociograms. These network diagrams were then compared to those generated by the pre-test data as well as the qualitative data captured during the process evaluation. Finally, the researcher analyzed the post-test data from the Organizational Learning Survey (Goh & Richards, 1997) before completing her interpretation.

### **Conclusion**

As described throughout this chapter, the intervention intended to measure the effectiveness of a set of digital resources to increase the quantity and quality of communication, build common language to describe innovation of classroom practice to prepare students for the knowledge economy, and improve organizational learning across multiple sites. Within the context of three small, suburban districts in the Northeastern region of the U.S., the researcher conducted a multi-site explanatory case study as a variant on an embedded mixed-methods design (Creswell & Plano Clark, 2011). As described by the theory of treatment, the participants within this purposive sample interacted with the digital resources to engage in the sociocultural activities of joint work, boundary crossing, and brokering (Honig 2008; 2012; Honig & Rainey, 2014, Swinnerton, 2007). Through pre and post-tests, the outcome evaluation incorporated quantitative and qualitative measures to examine changes in communication, language,

and organizational learning. A process evaluation embedded within this primary outcome study measured the fidelity of implementation.

The multi-site, mixed-methods, explanatory case study presented the best evaluation design for this intervention. First, this design focused on establishing relationships by examining events in context and capturing detailed descriptions (Martinson & O'Brien, 2010). Next, the researcher wanted to uncover not just the degree of change in outcome measures but how the intervention effected that change. Finally, though the conclusions described in the next chapter are descriptive and correlational in nature, the embedded process evaluation allowed the researcher to make inferences through inductive reasoning when looking both within and across the cases (Martinson & O'Brien, 2010).

### **Delimitations**

With the design of this research study, several delimitations need to be considered. Delimitations describe the boundaries imposed on the study by the researcher (O'Leary, 2014). In a traditional social science study, these boundaries could be the age of participants in the sample or the geographic location of the intervention (O'Leary, 2014). Within the context of this dissertation, the most critical delimitation surrounds the researcher's decision to focus on the interactions between school and district leaders rather than the classroom practice of teachers, the performance of students, or a specific focus on digital technology. Several factors influenced this decision.

- In the field of educational technology, most studies examine technology as an input and a traditional measure such as a standardized assessment as an output.

The *Worldwide Educating for the Futures Index* (Walton, 2017) describes the

fallacy of this approach as most outputs do not assess the actual cognitive skills required for success in the future. Further, little empirical evidence exists to directly connect technology use with improved student achievement on standardized measures (OECD, 2016; Zheng, Warschauer, & Lin, 2016).

- Studies surrounding innovation of classroom practice in response to the demands of the knowledge economy typically focus on technology access and use rather than pedagogy as a construct (Li & Choi, 2013). However, given the variation between schools, classrooms, and districts, no one practice might work across sites (Bryk et al., 2015) and the variation across content areas and grade-levels makes it difficult to measure Technological Pedagogical Content Knowledge (TPACK) as a construct (Brantley-Dias & Ertmer, 2013).
- The researcher decided to focus on the communication between leadership stakeholders — particularly between central office and building leaders — because it presented a domain with little prior literature and yet a significant influence on the creation and maintenance of systems to support innovation.

## **Chapter 5**

### **Findings and Discussion**

To increase the quantity and quality of communication between central office and building leaders, develop shared language to define innovation of classroom practice to prepare students for the knowledge economy, and improve organizational learning capacity, the researcher implemented an intervention in three districts within the Northeastern region of the U.S. Using Organizational Learning Communities (OLCs) (Senge, 1990; 2006) as an underlying theoretical framework, the researcher designed and implemented a set of digital resources in each district to help leaders clearly articulate areas of improvement, communicate with colleagues, as well as discuss new instructional practices based on the tenets of deeper learning, personalized learning, and authentic learning. Chapter three described the purpose of each resource to facilitate the activities of organizational learning: theory-building, practice, and capacity-building (Senge & Kim, 2013).

The previous chapter delineated the details of the intervention program and discussed the use of a multi-site explanatory case study as a variant on a mixed-methods, embedded research design (Creswell & Plano Clark, 2011). This last chapter reveals the results of the intervention study. When presenting the results of a multi-site case study, Martinson and O'Brien (2010) recommend the following organization: describe the implementation of the program, present the individual cases, and then discuss the themes and topics that emerged from across the cases. Therefore, the researcher first addresses the fidelity of implementation and the process evaluation. However, instead of presenting each case individually per the recommendation of Martinson and O'Brien



(2010), the researcher then organized the outcome evaluation by research question. For each question, she makes comparisons across the cases and then provides the details of each individual case. The discussion section then synthesizes the themes that emerged during the outcome evaluation and considers opportunities for future research. Finally, the chapter culminates by presenting limitations and conclusions.

### **Process of Implementation**

The intervention occurred in three public school districts in the Northeastern region of the U.S. between August - December 2017. After completing a pre-test, an initial training session introduced the purpose of the intervention and engaged participants in an activity to model the use of digital resources designed to improve communication, develop common language, and increase capacity for organizational learning. Throughout the intervention, participants received virtual feedback from the researcher via comments in the digital resources as well as email and met in-person on multiple occasions. A post-test concluded the intervention program.

### **Research and Evaluation Questions**

In accordance with the procedures of a mixed-methods, multi-site case study, the researcher embedded the process data within the outcome data to build rich descriptions for each participating site and then triangulate findings across them (Creswell & Plano Clark, 2011; Martinson & O'Brien, 2010). Without an understanding of the intervention process, the researcher could not make inferences or offer explanations about the outcomes (Creswell & Plano Clark 2011). To organize the data and examine the relationship between the process and outcome evaluations, the researcher used the evaluation questions as sub-questions to the outcome questions as shown below.

RQ1: To what degree did using the digital resources affect the organizational learning capacity of the districts?

- EQ1: With what frequency did the participants use the different resources?
- EQ4: To what extent did the implementation of the program adhere to the intended design?

RQ2: How did the language used by participants to describe innovative classroom practice to prepare students for the knowledge economy change as a result of using the resources?

- EQ1: With what frequency did the participants use the different resources?
- EQ2: How did participants use the digital resources to engage in conversations about innovation of classroom practice with members from different stakeholder groups in their district?

RQ3: How did engaging in the sociocultural activities with the resources affect communication between the participants within their districts?

- EQ1: With what frequency did the participants use the different resources?
- EQ3: How did the participants within the different districts use the same set of digital resources?
  - EQ3a. Given that each district received the same resources, did existing strategic or technology plans moderate participants' choice of resources or use of the tools?

- EQ3b. Did the existing organizational structures of the districts moderate the effects of the intervention program?
- EQ4: To what extent did the implementation of the program adhere to the intended design?

### **Fidelity of Implementation**

According to Dusenbury et al. (2003), fidelity of implementation includes discussion of frequency or dose, adherence to the original design, participant responsiveness, as well as quality and program differentiation. Within the context of this intervention, the researcher used multiple indicators of frequency, adherence, and responsiveness to measure fidelity (see Appendix E for data summary). This section first presents an analysis of program fidelity for the entire study and examines each indicator individually. After the general discussion, the researcher details the implementation process that occurred within each individual district.

**Frequency and Dose of the Intervention Program.** Before beginning the intervention, challenges of fidelity arose due to scheduling constraints within each site. According to the intervention program design, the initial training session should have included all participants for a duration of 1.5 hours. Additionally, participants should have participated in four, 30-minute check-in meetings throughout the intervention. However, as indicated by the data in Table 13, participants across the sites did not receive a consistent dose of face-to-face contact.

Table 13

*Frequency of face-to-face contact*

	Bridgetown	Bayview	Hilltop
Training (time)	55-minutes to 1.5-hours depending on the group	1.5 hours	1.5 hours
Training (attendance)	100% attendance	97.4% attendance	95.1% attendance
Face-to-Face #1	Used as 55-minute training for DLT coaches (2 did not attend and completed a 60-minute make-up session)	15 minutes with 60.5% attendance	High School: 30 minutes with 4 coordinators  Elementary School: 30 minutes with entire group  Middle School: cancelled meeting
Face-to-Face #2	30-minute session with 57.9% of admin council or 33.3% of total sample	90-minute observation with 47.4% attendance	High School: 30 minutes with 1 coordinator  Elementary School: 30 minutes with entire group  Middle School: 30 minutes with entire group

Face-to-Face #3	30-minute session with 50% of admin council or 27.3% of total sample	90-minute observation with 47.4% attendance	<p>High School: 30 minutes with 3 coordinators</p> <p>Elementary School: 30 minutes with entire group</p> <p>Middle School: 30 minutes with entire group</p>
Face-to-Face #4	45-minute activity with 42.4% attendance	5 minutes with 52.6% attendance	<p>High School: 30 minutes with 3 coordinators</p> <p>Elementary School: 15 minutes with entire group</p> <p>Middle School: 30 minutes with entire group</p>

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Though Bayview and Hilltop both received the full 1.5-hour training session, Bridgetown did not. The admin session – which included the central office administrators, principals, and assistant principals — ended 15 minutes early, and the Digital Learning Team (DLT) coaches’ session only lasted for 55 minutes. Only the elementary coordinators in Hilltop participated in all four check-in meetings, and the last one did not last the full 30 minutes. In Bayview, two of the sessions lasted 90 minutes instead of the intended 30 minutes, and the researcher assumed the role of a participant-observer rather than researcher (Lochmiller & Lester, 2017). As will be discussed within the individual cases, none of the check-in meetings adhered to the original design.

Two indicators of frequency could also be measured from the digital resources: the number of interactions that participants had with each resource on a weekly basis and

the number of unique “clicks” made by participants on specific hyperlinks to access the digital resources. Weekly access of the resources would have indicated high fidelity. Participants only accessing the resources when explicitly directed during the training or face-to-face meetings would constitute low fidelity, and sporadic use beyond those face-to-face opportunities would indicate moderate fidelity. Similarly, a majority of the sample within each district clicking on each link would be an indicator of high fidelity. Half of the sample clicking would indicate a moderate level, and fewer than two clicks per district per week would serve as a sign of low fidelity.

Across all three districts, on both of these indicators, fidelity could be described as moderate to low. Only 39.4% of the participants in Bridgetown, 15.8% in Bayview, and 17.1% in Hilltop used the digital resources outside of face-to-face interactions. With few exceptions in each district, the individuals who used the digital resources only did so on one occasion.

Additionally, across all three districts, the number of clicks per week remained consistently low. During several weeks, no participation could be detected. If high fidelity had been achieved, then the total number of clicks would have been the product of the sample size multiplied by the number of weeks (16) in the intervention program. That product would imply that each person in the sample accessed the digital resources one time per week. However, as illustrated by Table 14, the number of clicks captured per district, per resource, over the course of the intervention was extremely low.

Table 14

*Frequency of Interaction per Resource Based on Clicks*

	Bridgespan (n=33)	Bayview (n=38)	Hilltop (n=41)
Total Clicks	146 (high fidelity = 528; less than 28% of the sample)	89 (high fidelity = 608; less than 14.6% of the sample)	129 (high fidelity = 656; less than 19.7% of the sample)
Resource Guide	40.4% of clicks	39.3% of clicks	45% of clicks
Essential Improvements	37.7% of clicks	12.4% of clicks	8.5% of clicks
Think-Feel-Care	2.1% of clicks	2.2% of clicks	7% of clicks
Empathy Map	0%	9% of clicks	6.2% of clicks
Polarity Map	0.68% of clicks	9% of clicks	7.7% of clicks
Technology for the Purpose Of...	19.2% of clicks	12.4% of clicks	10.1% of clicks

Overall, participants accessed the *Resource Guide* more than any of the individual resources. This guide included detailed descriptions of each resource, video tutorials to scaffold their use, and suggested activities to attempt with the resources. When looking across districts, participants in Bridgetown had the highest frequency of access as compared to the other districts. As will be discussed in a later section, the Director of Educational Technology in Bridgespan encouraged the DLT Coaches to use the *Essential Improvements* resource on several occasions which could be a factor in their increased access.

**Participant Responsiveness Throughout the Intervention.** According to Dusenbury et al. (2003), responsiveness measures the degree to which participants engaged in the program. Though the frequency of interactions that participants had with

the digital resources offered some indication of responsiveness, qualitative analysis of the outputs from the individual resources provided a more thorough understanding. As illustrated by the data in Table 14 above, participants gravitated towards different resources. To better understand the effect of the intervention activities on the process of developing common language and improving communication, the researcher monitored how the participants used the resources, with whom they interacted, as well as where the use of resources occurred.

***Responsiveness During the Training.*** During the initial training sessions, participants were asked to complete a hands-on activity with the *Essential Improvements* resource. In Bridgetown, all of the admin council members and Digital Learning Team (DLT) coaches participated in the activity during their training sessions. Of particular note, the Superintendent, Assistant Superintendent, and Director of Educational Technology discussed the benefits of thinking through the questions presented by the resource and advocated for using it as a protocol to push their thinking beyond the status quo. On the contrary, 73.7% of the participants in Bayview and 87.8% of the participants in Hilltop did not participate. Further, in both of those sites, neither the Superintendent nor Assistant Superintendent engaged in the activity.

***Responsiveness with the Digital Resources.*** Throughout the intervention, the researcher monitored and analyzed the information entered into the digital resources on a weekly basis. High fidelity could be characterized by thoughtful selection of the resources to meet a specific need or engage in a desired form of communication. Participants using only a limited selection of resources, only employing the resources



during face-to-face meetings, or not using them at all constitutes low fidelity. Across all three sites, participants rarely used the resources outside of the face-to-face meetings.

Most interactions occurred within the *Essential Improvements*, *Think-Feel-Care*, and *Polarity Map* resources, and participants only attempted the *Technology for the Purpose Of...* resource on two occasions — once in Bridgespan and once in Hilltop. Further, none of the participants thoroughly completed their work in any of the resources, only partially answering the questions in each resource. In particular, most participants left the reflection area of the resource blank. Figure 8 serves as an example of an incomplete resource. This participant did not use the reflection area or complete all of the prompts in the *Essential Improvements* resource.

How Might We... Identify & Define Essential Improvements			
How might we make a change in environment, behavior, and/or beliefs to improve student learning?	Why might we implement that change?	How might we know if it worked? (Observable Measurement)	My Reflections
Forcing the time to recenter/breathe/mindful every class. This should result in further willingness to persevere through tasks.	We all need it and it is so important to continue to strive to be our best selves. it is easy to get wrapped up and forget to take the time.	When students are recognizing their own feeling for a need to take a breath. (Consistent bell ringing?)	
Continue to build a larger voice community via the use of global connections with Flipgrid			
Build community beyond our walls - to include parents/SCmembers to know what is happening here at KMS when it comes to teaching and learning with EdTech tools	Grow our TechUsOut night from 2016.... now that we are 1:1 in the building!	Number of teachers who are willing to participate compared to last year. Number of Parents who attend this year and their feedback shared to us	
Ask teachers now that Quarter 1 is ending if they want to work with me to help improve their teaching and learning through EdTech	The beginning of the year has been hectic! Now that the kinks are somewhat smoothed out, maybe a teacher or two will be interested in some co planning and teaching of lessons.	Willingness to put themselves out there to try.	

*Figure 8.* Incomplete resource example. This participant partially completed one item and left the reflection area blank.

Finally, in accordance with the theory of treatment, participants should have engaged in the sociocultural activities of joint work, boundary crossing, and brokering (Honig, 2008; Honig & Rainey, 2014; Swinnerton, 2007) when using the resources. Adding details about conversations into the tools as well as providing anecdotal evidence of using the tools with different stakeholders during the check-in meetings would have

indicated high fidelity. Low fidelity could be described as non-use of the resources, lack of details entered into the tools, or using the tools solely during the face-to-face meetings rather than in interactions with colleagues.

Across all three districts, participants used the resources in different ways and for different purposes. During the design of the intervention, the researcher recognized that the cultures, experience levels, and dynamics of each district may affect their responsiveness to the intervention. Moreover, the researcher examined the effect of two moderating variables: the existing technology or strategic plans and the organizational structures. The individual case studies address the effect of these moderating variables and present the details of what occurred within each district during the intervention.

**Adherence to the Design of the Intervention Program.** In addition to the challenges of frequency and dose, the researcher modified several core components of the intervention. Though these changes allowed the researcher to better meet the needs of the participants, the intervention did not adhere to the original design (Nelson et al., 2012). Using a reflective journal, attendance spreadsheets, and audio recordings of face-to-face interactions as the data sources, the researcher documented adherence. First, the researcher noted a discrepancy in the delivery of the initial training sessions. Next, the researcher examined the implementation of the actual resources and noted any changes made to the individual tools. Finally, an attendance sheet, the researcher's journal, and audio recordings provide detailed descriptions of the face-to-face check-in meetings.

Only the elements completely within the researcher's control took place as intended. On a weekly basis, participants from each site received an email announcement with additional information about the resources, summaries of discussions that had taken

place within the context of the intervention, or the recommendation of a related article or resource. Throughout the intervention, the researcher used a journal to document all interactions that occurred within the digital resources as well as the contents of all electronic communication including phone calls, emails, and digital comments left within the digital resources using the Google Sheets commenting feature.

With an embedded mixed-methods design, the details of the process evaluation inform the results of the outcome evaluation (Creswell & Plano Clark, 2011). Across the three sites, neither the core components of the design nor the program as a whole could be implemented with fidelity (Nelson et al., 2012) given the varying conditions and constraints present in each district. A lack of participant responsiveness across all three sites, described in detail in the following sections, also played a significant role in the analysis of the process evaluation. For these reasons, understanding the fidelity of implementation became critical to the analysis of the outcome questions.

### **Bridgespan Process of Implementation**

**Change in Demographics in Bridgespan.** At the start of the intervention, the sample in Bridgetown ( $n=33$ ) included 29 females (87.8%) and four males (12.1%) who held a variety of central office and building-level leadership positions: Superintendent, Assistant Superintendent, directors from the central office, principals or assistant principals, and coaches or specialists from the buildings. Notably, Bridgetown was the only district where both the Superintendent and Assistant Superintendent remained in the study and completed the post-test. Though only 18 participants completed the post-test (45.5% attrition), the general characteristics of the sample remained consistent between the pre and post-test environments with three exceptions. The post-test sample included

fewer principals and assistant principals, individuals with less experience in their current position, and participants with fewer years of teaching experience (see Table 15).

Table 15

*Bridgetown Demographics*

Demographic	Pre-Test	Post-Test
Sample size	<i>n</i> =33	<i>n</i> =18
Gender	87.8% female, 12.1% male	88.9% female, 11.1% male
Central Office	24%	27.8%
Principal/Assistant Principal	33.3%	28.8%
Coach	48.5%	44.4%
High School	24%	22%
Middle School	15%	17%
Elementary School	41%	39%
% with 6+ Years in the District	60.6%	62.8%
% with 6+ Years in Current Position	48.5%	33.3%
% with 6+ years of Teaching Experience	93.9%	82.2%
% with 6+ years of Leadership Experience	48.5%	50%

The participants in Bridgetown had more teaching experience than those in the other two districts, but fewer years in the district. This latter fact could be attributed to the relatively young tenure of the central office administration. In 2014, the Superintendent and Assistant Superintendent assumed their positions. They hired the Director of Educational Technology in 2015, subsequently beginning the Digital Learning Team (DLT) program. Compared to the two districts from the North state, this is a relatively new administration working to implement recently developed change

initiatives. As discovered during the process evaluation, lack of established language, vision, and procedures proved to be a challenge to the intervention.

**Fidelity of Implementation in Bridgetown.** Before the intervention began, challenges to fidelity presented themselves. First, the Assistant Superintendent and Director of Educational Technology insisted that the admin council and DLT coaches use separate sets of resources. They felt as though the coaches might be more amenable to using the resources and sharing their thinking if their principals could not see their work. “Even keeping the admin group open makes people not want to put things in. They don’t want [Superintendent] to read anything” (Bridgetown Director of Educational Technology, personal communication, September 8, 2012). In a later phone conversation, the Director of Educational Technology revealed that animosity existed between some of the principals and the DLT. He claimed that the principals did not agree with the direction of the group or the personalized learning initiative, which further explained the rationale for keeping the admin council and coaches in separate digital spaces despite the desire to improve communication between them.

***Initial Training Session (Dose and Adherence).*** Because of union contracts, the DLT coaches could neither attend the initial training session with the admin council nor participate in any check-in meetings outside of the already scheduled bi-monthly DLT meeting times (Bridgetown Assistant Superintendent, personal correspondence, August 10, 2017). Therefore, the researcher conducted the initial training with the central office administrators and building principals in August but did not meet the DLT coaches until late September. Additionally, the researcher only received 55-minutes to complete the training with the DLT coaches instead of the 1.5 hours specified by the intervention

design. Two of the coaches could not attend the training session, so the researcher conducted a make-up training with them two weeks later. This ad hoc session did not adhere to the intended design of the training program and evolved into a more informal conversation.

***Check-in Meetings (Frequency, Dose, and Adherence).*** The intervention design specified that four, 30-minute check-in meetings occur one time per month. Again, due to the constraints from the union, these meetings did not proceed as designed. To accommodate the DLT coaches, the first check-in meeting became their training session. As such, only four of the principals attended with their coaches: high school, a principal and assistant principal from elementary building 1, and an assistant principal from elementary building 3. During the second check-in meeting, the researcher met with 12 of the 19 members of the admin council who had attended the initial training. Neither the high school principal, the principal from elementary building 2, nor the Director of IT attended this meeting. Other absences included the Director of Title I and the Discipline Dean.

At the third check-in meeting with the admin council, only nine members attended. Absences included the Assistant Superintendent, Director of Educational Technology, high school principal, and several elementary principals. The Superintendent only attended part of the meeting. As a result of these absences, the remaining participants seemed more open to discussion than during the previous meeting times. When analyzing the audio transcript, the researcher noted that almost every individual spoke at some point, and the conversation sounded more animated.

When the Superintendent left the room, the researcher asked the principals what external factors could be attributed to their lack of responsiveness to the intervention. Answers ranged from “learning about the new walkthrough evaluation system” to “dealing with kids” to “running a school.” The researcher asked for more information about the walkthrough evaluation system and pressed the principals to define the learning that they hoped to see in their classrooms. For several minutes, an animated conversation ensued with so many voices that the researcher could not identify all of them from the audio recording. However, the conversation slowed considerably when the Superintendent returned to the meeting. After his return, only the principal from elementary building 1 continued to respond to questions.

The researcher met not only with 11 of the 17 DLT coaches but the entire DLT team during the final check-in meeting. Because this meeting occurred during one of the bi-monthly DLT meetings, it had to fit within their schedule. During the first part of the meeting, the DLT research and development team held a “gallery walk” of projects that they had implemented in their classrooms. Before the meeting, the Director of Educational Technology explained that these projects should be a demonstration of personalized learning. However, in observing the presentations, he remarked that “there’s not a lot of personalized learning happening in these projects” (personal communication, December 12, 2017). The Assistant Superintendent and Superintendent, on the other hand, seemed pleased with the projects as they aligned to many of the content standards.

The researcher led an activity during the second part of the meeting using the *Essential Improvements* resource. Prior to the check-in meeting, the Director of

Educational Technology requested that they focus on using the *Essential Improvements* resource to work on a shared definition of personalized learning. Therefore, the researcher modeled the process of using the resource and then coordinated conversations between the coaches and other DLT members.

***Activity in the Digital Resources (Responsiveness).*** In addition to the already mentioned challenges of fidelity, the researcher noted that only one of the principals and very few of the coaches accessed the resources outside of the face-to-face meetings. During the admin council meetings, the principals cited lack of time and “curriculum overload” (Bridgetown elementary principal, October 25, 2017) as a rationale for their lack of responsiveness. The coaches, on the other hand, expressed different reasons. One of the elementary coaches commented during the make-up training session that they received a stipend for their efforts but no extra time to complete the work. A middle school coach corroborated this claim and intimated that their schedules did not allow for them to work with the teachers whom they would like to help. A different middle school coach echoed this sentiment and stated that “Until the principal carves out time, it's not going to happen” (personal correspondence, October 25, 2017).

According to Willower (1991), time norms create spheres of influence. As outside reform efforts make demands on time, it becomes a currency for power. Because those who take on extra work make greater gains, social pressures established by the culture of the organization could work against individuals dedicating effort to new initiatives (Willower, 1991). Across all three districts, participants cited “lack of time” as a reason for their lack of participation.



## Bayview Process of Implementation

**Change in Demographics in Bayview.** Despite initial support from the Assistant Superintendent, neither he nor the Superintendent remained in the intervention study through completion of the post-test. Further, more participant attrition occurred in Bayview (73.7%) than either of the other districts. As shown by Table 16, the large amount of attrition dramatically changed the composition of the sample between the pre and post-test environments.

Table 16

### *Bayview Demographics*

Demographic	Pre-Test	Post-Test
Sample size	<i>n</i> =38	<i>n</i> =10
Gender	63.2% female, 36.8% male	60% female, 40% male
Central Office	18.4%	30%
Principal/Assistant Principal	28.9%	30%
Coach	52.7%	40%
High School	31%	54%
Middle School	7%	8%
Elementary School	38%	31%
% with 6+ Years in the District	76.3%	70%
% with 6+ Years in Current Position	34.3%	20%
% with 6+ years of Teaching Experience	78.9%	80%
% with 6+ years of Leadership Experience	44.8%	70%

The post-test sample included more central office members, a higher proportion of participants from the high school than the other divisions, and fewer coaches.

Additionally, participants in the post-test sample possessed more years of leadership experience. Conversely, when compared to the pre-test samples in the other two districts, participants in Bayview had less experience in their current position, in the teaching profession, and in a leadership capacity.

**Fidelity of Implementation in Bayview.** Issues with frequency, adherence, and responsiveness (Dusenbury et al., 2003) emerged in Bayview beginning with the initial training session. Because the Assistant Superintendent provided an incomplete participant list, 17 of 47 possible participants neither received the informed consent and pre-test before the training session nor could access the digital resources during the training. Six of those individuals later declined to participate in the intervention as did three others. Additionally, many of the participants had not checked their email in the final weeks of summer and therefore had neither read the recruitment letter, completed the pre-test, nor were aware that the training would occur.

**Training Session (Responsiveness).** During the training, only 26.3% of the participants took part in the introductory activity - an indication of low responsiveness. Neither the Superintendent nor Assistant Superintendent participated in the activity or contributed to the discussion during the training session. Further, at the conclusion of the 1.5-hour session, the Superintendent remarked that participation in the intervention should be considered secondary to other district responsibilities and not viewed as an obligation. Shortly thereafter, two participants — the Director of Response to Intervention (RTI) and Elementary English Language Learners (ELL) Coordinator — privately approached the researcher and requested their own set of resources. They indicated that working in a collaborative space could present “privacy” challenges.

Though the Assistant Superintendent said that he would find a way to encourage participation early in the school year, the training session forecasted the lack of responsiveness observed throughout the intervention.

***Check-in Meetings (Frequency and Adherence).*** Much like with Bridgetown, issues of frequency and adherence (Dusenbury et al., 2003) also manifested with the face-to-face meetings. The program design called for four, 30-minute check-in meetings during the intervention. None of those occurred as planned. At the first meeting, the researcher intended to ask three structured questions:

- Do any of you have questions for me about the resources or any of your experiences using them to date?
- What has been the most helpful since our last meeting? Even if you have not yet used the digital resources, have any of the concepts behind them been of service as you work through these first few days of school?
- It appears as though most of you have not yet had a chance to explore these resources, how might I better support you?

After addressing basic questions about the technical configuration of the resources themselves, the researcher asked whether any of the concepts had been of use. The Superintendent quickly replied and offered an excuse for the lack of responsiveness.

Honestly, just to apologize. What I really should be doing is modeling some of the tools here. Just with the start of the school, I haven't been able to get to it yet. So what I'm hoping is that our conversations, if I can model some of the tools here, would pick up the pace a little bit. So, we'll do that moving forward (personal communication, September 14, 2017).

Initially, the researcher interpreted this reply as a sign of leadership. However, as will be explained throughout discussion of Bayview, the comments from the Superintendent could instead be viewed as merely symbolic (Bolman & Deal, 2008). Throughout the intervention, the Superintendent never used or modeled the use of the resources.

In response to the third question about possible additional supports, one of the elementary school principals responded with “more time” (personal communication, September 14, 2017). That comment elicited affirmation from a number of individuals, and echoed the sentiments expressed by the principals in Bridgetown. As mentioned, time becomes a currency for power when outside reform efforts place new demands on individuals (Willower, 1991).

The Union President had a different response and requested an analog version of the digital resources. To accommodate this, the researcher created a printable version of the resources and made it available as a link. Over the course of the intervention, participants only accessed this printable version on 14 occasions, accounting for 15.73% of the clicks on the tracking links. The first check-in meeting lasted for a total of 15 minutes before the Superintendent ended the conversation.

Before the second check-in, the Superintendent and Assistant Superintendent suggested attending the entire admin council meeting and participating in their book talk about The Innovator’s Mindset by George Couros. The Assistant Superintendent decided to design the conversation around the three prompts from the *Essential Improvements* resource: *How might we make a change in environment, behavior, and/or beliefs to improve student learning? Why might we implement that change? How might we know if it worked?* The Superintendent did not attend the meeting.

The admin council should have lasted 90-minutes per the schedule from the Superintendent, but most participants arrived at least 10-minutes late and the meeting began 15-minutes late. Several participants did not have a copy of the book and had not completed the required reading. After asking participants to share their initial reflections to the first two chapters of the book, the Assistant Superintendent directed them to break into groups and discuss how they might approach change and innovation. Though the Assistant Superintendent stated that he would use the prompts from the *Essential Improvements* resource, he neither read nor memorized them. As such, his rendition did not adhere to the design of the prompts.

We all have opportunities across the district for things that we know are ongoing headaches or issues. So, what I want you to do is think about this... pick one area where you think you could use some change... Why do we do this? ... How could we make it better? (personal communication, October 19, 2017).

Throughout the meeting, the researcher assumed the role of participant observer (Lochmiller & Lester, 2017), taking notes and contributing when asked. At the end of the meeting, the Assistant Superintendent announced that the questions used to guide the conversation had come from the *Essential Improvements* resource and encouraged participants to go back and review the prompts before the next meeting. Only the Union President complied.

Though the third check-in meeting intended to follow the same framework as the second with a continued book talk, three major discrepancies occurred. First, the Superintendent assumed control of the conversation from the Assistant Superintendent within the first few minutes and did not use the *Essential Improvements* resource as a

framework for the discussion. Next, the Superintendent spent the majority of the meeting discussing political issues within the district. Finally, in connecting a conversation about empathy from the book to conflict associated with the district capacity project, a discussion evolved about the Superintendent asking the Union President not to attend the meeting. In what one of the high school assistant principals described as a “cryptic” conversation (personal communication, November 16, 2017), the Superintendent explained the need to “re-establish our norms... so as not to appeal to the non-empathetic parts of our organization” (personal communication, November 16, 2017).

This conversation proved invaluable as it elucidated two dynamics within the district. First, it illustrated that conversation did not always translate into action from the central office — another demonstration of what Bolman and Deal (2008) would describe as symbolic communication. Though the Superintendent discussed the need to address norms, no concrete steps were ever mentioned. Second, it explained the changes in communication patterns between the pre and post-test sociograms discussed later in the chapter.

As with the previous meeting, the researcher assumed the role of participant observer (Lochmiller & Lester, 2017). When prompted by the Superintendent to contribute to the discussion, the researcher connected the conversation about empathy to the *Think-Feel-Care* resource. Because that resource intended to help the user consider the thoughts, emotions, and values of others (Clapp et al., 2017), the researcher suggested it as a strategy for engaging in empathy.

The district rescheduled the final check-in meeting until the day before the winter break. As a result, instead of a conversation about The Innovator’s Mindset or the digital

resources, participants watched a performance from the pre-school, completed a science activity to make fake-snow, and shared “celebrations and laugh-lines” to kick off the holiday season per the direction of the Superintendent. During the final five-minutes of the meeting, the researcher thanked participants for their participation and notified them that a post-test survey would be emailed to them the following morning.

***Activity in the Digital Resources (Responsiveness).*** With three exceptions, the researcher detected very little participant responsiveness. First, the Union President engaged with the *Essential Improvements* and *Technology for the Purpose Of...* resource until she was asked to stop attending the admin council meetings. These interactions included ongoing conversations with the researcher via the comments tool inside the digital resources. Second, the Director of RTI used the *Essential Improvements* resource as well as *Think-Feel-Care* and the *Empathy Map* in digital form. However, when interacting with colleagues, she utilized the printable versions and shared her work with the researcher via email. As mentioned, the Director of RTI and Elementary ELL Coordinator expressed concerns about working in a collaborative environment. Finally, the Elementary ELL Coordinator wanted her own digital copy the *Polarity Map* to use with the ELL instructors. In a virtual meeting, the researcher helped her to make a copy of that particular resource and then design a collaborative activity to work with the other ELL instructors.

When examining the qualitative data, the researcher coded events such as those with the Director of RTI and Elementary ELL Coordinator as demonstrations of political power (Bolman & Deal, 2008) because they manifested from political concerns about others viewing their work. According to Bolman and Deal (2008), political power may

be positional, coercive, or personal. Individuals might exert political power to control scarce resources — such as time — or to exert control over an agenda through the formation of alliances (Bolman & Deal, 2008). Though the intervention intended to improve communication and foster organizational learning, instead it revealed the underlying power dynamics within the district — a finding supported by the social network analysis. The researcher also observed this dynamic in Hilltop, the other district from the North state.

### **Hilltop Process of Implementation**

**Change in Demographics in Hilltop.** In planning the intervention during the Spring of 2017, the Superintendent warned that the district would be undergoing a strategic planning effort in the Fall, coinciding with the intervention. At that time, the Assistant Superintendent intimated that the intervention could assist in the strategic planning process. However, she then left the district to accept a position as Superintendent in a different state. Her departure introduced two unanticipated challenges into the intervention: a new Assistant Superintendent and a change in dynamics within the leadership team.

Whereas the prior Assistant Superintendent had championed for instructional innovation and actively worked to build a professional community with the middle and lower school coordinators, the new Assistant Superintendent inherited a challenging political environment. Because she had been promoted from her previous position as an elementary principal, the new Assistant Superintendent did not have a relationship with the middle and high school principals or coordinators. Additionally, the middle school principal who had also wanted the promotion now reported to her.



Some of the participant attrition (61%) and lack of responsiveness could be attributed to this leadership dynamic in the central office. Neither the two middle school principals nor the Superintendent ever accessed the resources or completed the post-test. Additionally, within the high school, the coordinators expressed dissatisfaction with the entire process of the intervention and attributed their lack of participation to changing leadership. They argued that they had not been aware of the intervention in advance and would have appreciated prior notice.

In coding the transcript from the meeting when the high school coordinators made the above comments, the researcher noted in her journal that the previous Assistant Superintendent had sent multiple emails about the intervention both during the needs assessment in the Fall of 2016 and before leaving the district in the Spring of 2017. Bolman and Deal (2008) would describe the use of blame as a manifestation of structural power. When members in organizations experience failure or difficulty, they often blame structures, bureaucratic processes, or one another to maintain their own position of power (Bolman & Deal, 2008). Throughout the intervention, the researcher documented instances where participants blamed either the prior Assistant Superintendent or other district structures for their inability to fully participate. She coded each instance as *structural power*.

As a result of the 61% attrition rate, the post-test environment included fewer principals and a lower percentage of high school participants than the pre-test. When examining both the pre and post-test data, fewer central office administrators and principals actively participated in the intervention and completed the post-test than either of the other districts. The pre and post-test samples also included more middle school

representation than the other districts, and participants in Hilltop had more leadership experience (see Table 17).

Table 17

*Hilltop Demographics*

Demographic	Pre-Test	Post-Test
Sample size	<i>n</i> =41	<i>n</i> =16
Gender	78% female, 19.5% male*	81.2% female, 18.8% male
Central Office	14.6%	12.5%
Principal/Assistant Principal	34.1%	18.8%
Coach	46.3%	68.7%
High School	38%	26%
Middle School	26%	30%
Elementary School	38%	35%
% with 6+ Years in the District	82.9%	87.5%
% with 6+ Years in Current Position	56.1%	62.5%
% with 6+ years of Teaching Experience	87.8%	87.6%
% with 6+ years of Leadership Experience	73.1%	81.3%

\* one missing value so percentages do not add up to 100%

**Fidelity of Implementation in Hilltop.** Similar to the other two districts, the intervention program in Hilltop experienced challenges of frequency, dose, adherence, and responsiveness (Dusenbury et al., 2003) even before the initial training session. Whereas Bridgetown and Hilltop allocated time for the face-to-face check-ins during designated leadership meetings, Hilltop would not sacrifice any of their District Leadership Team meetings. Instead, the researcher scheduled to meet with the elementary, middle, and high school coordinators separately. Though each of the four

meetings intended to last for 30-minutes per the intervention design, challenges prevented that from occurring consistently.

***Check-in Meetings (Frequency and Adherence).*** With the elementary coordinators, the researcher met with the group on four occasions. However, the last meeting only lasted for 15-minutes due to scheduling constraints. The middle school cancelled the first meeting, so the researcher only met with the group for three of the 30-minute sessions. In both the elementary and middle school meetings, the participants asked questions and requested that the researcher guide them in using the resources. It is important to note that the Assistant Superintendent attended the last middle school meeting, three of the lower school meetings, and three meetings with the high school. Her presence did impact the discussions — particularly in the middle and high school.

With the high school, the researcher attended four, 30-minute meetings, but the participants did not. At least one person from the four-person group of high school coordinators did not attend meetings one, three, and four. During those meetings, most conversation revolved around why they did not use the resources. The Assistant Superintendent attended each of those meetings and played an active role in the conversation.

On the day of the second high school meeting, the Assistant Superintendent did not attend and neither did the high school coordinators. Upon arrival at the high school, the researcher signed-in with the secretary per security protocol and was then directed to an upstairs conference room rather than the regular location. Several minutes after the designated start-time, the K-12 Foreign Language Coordinator arrived. She had not attended the first meeting and stated that she had not been notified of its occurrence.

However, the researcher has a record of the Assistant Superintendent sending an email invitation to all of the participants. Shortly after the meeting, the researcher received an email from the high school coordinators who did not attend stating that they had waited in the same location as the first meeting.

The researcher does not know exactly what transpired, but coded notes about the event as a display of political power (Bolman & Deal, 2008). Coalitions and factions who work to protect their own self-interest instead of the greater good characterize organizations plagued by political power (Bolman & Deal, 2008). After the first check-in meeting, the Assistant Superintendent described the high school coordinators as the most resistant group in the district. She stated that they refused to work with others and perceived themselves to be excellent leaders, but she questioned that reality when comparing them to other groups in the district. Therefore, their resistance to the intervention and potentially refusing to attend the one meeting that she missed could be described as a political power play based on Bolman and Deal's (2008) definition.

***Training Session (Responsiveness).*** The researcher implemented the training as designed, and only one participant did not attend. However, analysis of the Essential Improvements resource revealed that only 12.2% of the participants completed the initial activity - indicating low responsiveness. During discussion of the activity, one of the middle school principals raised concerns about the collaborative nature of the digital resources. Instead of viewing the resources as an opportunity for transparency and sharing, she felt that it created "privacy" concerns.

***Activity in the Digital Resources (Responsiveness).*** Throughout the intervention, Hilltop participants expressed concerns about the collaborative nature of the digital

resources. In a conversation about using the Polarity Map with the Assistant Superintendent, she attributed the politics around her promotion as a reason for not using the resources in their digital form.

So, I'm trying to be very thoughtful about what I've put in there so that people don't read too much into some of what I'm doing — and yet some of the deep thinking I need to do, I'm using those things but not in your document (personal communication, September 29, 2017).

This concern about others reading and interpreting their thoughts in the digital resources could be a contributing factor to the lack of responsiveness. However, even after making a printable version of the resources available as a modification to the original design, the link to open them was only accessed seven times during the intervention, accounting for 5.4% of the tracked links. After the second check-in meeting on October 20th, all of the participants in Hilltop stopped using the resources in their digital form.

As discussed earlier in this chapter, with a mixed-methods, embedded design, the secondary process evaluation informs analysis of the outcome data (Creswell & Plano Clark, 2011). The frequency with which the participants used the different resources, extent to which the implementation of the program adhered to the intended design, and the responsiveness of participants affected the analysis of the dependent and mediating variables. Without understanding the process of implementation, it would not be possible to examine how the intervention influenced the district's capacity for organizational learning, development of shared language to describe innovation of classroom practice to prepare students for the knowledge economy, and communication between social networks.

## **Outcome Evaluation**

Within this intervention, the outcome evaluation intended to measure differences between the pre and post-test environments (Rossi et al., 2004). An online survey administered before the start of the intervention and at the conclusion collected quantitative data through the Organizational Learning Survey (OLS) (Goh & Richards, 1997) and School Staff Social Network Questionnaire (SSSNQ) (Pitts & Spillane, 2009) as well as qualitative data via open response questions. According to the causal model presented in the previous chapter (Figure 7), access to the intervention should have resulted in a change in quantity and quality of communication, the development of common language to describe innovation of classroom practice to prepare students with future skills for the knowledge economy, and increased capacity for organizational learning. Though the lack of fidelity and the high rates of participant attrition (Bridgespan - 45.5%, Bayview - 73.7%, and Hilltop - 61.0%) affect the ability to make causal inferences between the pre and post-test environments (Shadish et al., 2002), the goal of the study was to triangulate findings with the qualitative process evaluation to build thick descriptions about what occurred within the context of each case (Martinson & O'Brien, 2010).

### **Capacity for Organizational Learning**

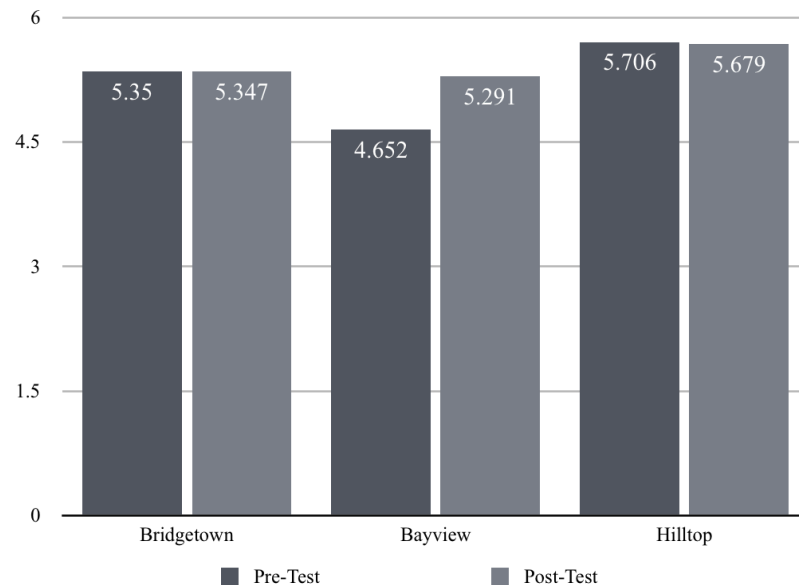
The first research question sought to determine whether a change in organizational learning capacity occurred during the intervention as measured by the pre and post-tests with the Organizational Learning Survey (OLS) (Goh & Richards, 1997). To measure the dependent variable, the districts' capacity for organizational learning, the researcher compared pre and post-test responses on the OLS. One of the few valid

instruments designed to measure the tenets of Senge's (1990) concept of organizational learning, the OLS asked participants to respond to 21 items that measured five sub scales: clarity of purpose and mission; leadership commitment and empowerment; experimentation; transfer of knowledge; as well as teamwork and group-problem solving. Participants rated their responses on a seven-point Likert-scale that ranged from *strongly agree* to *strongly disagree*. According to Goh and Richards (1997), descriptive statistics can be used to compare mean scores on the individual sub scales as well as the total scale. Though a later analysis of the OLS instrument (Goh et al., 2007) indicated that the sub scales on the OLS highly correlated to the overall construct measured by the scale and could thus be examined as a single scale, the researchers also noted that it may be valuable to examine the specific sub-constructs constituted by the sub scales as they represent different tenets of learning organizations. Therefore, the researcher conducted analyses on both the OLS scale and the individual sub scales to examine the individual tenets of learning organizations as well as the overall construct.

After importing the data from the pre and post-tests into a statistical software package (SPSS 24.0), the researcher began analysis by exploring potential differences in central tendency, namely mean and median scores, between the pre and post-tests within each district. Measures of central tendency elucidate how scores relate to each other as well as demonstrate how those values correspond to the arithmetic average (Lochmiller & Lester, 2017). Salkind (2014) also recommends frequency distributions and an examination of variation as an effective form of initial analysis. Generating graphs such as box plots can further facilitate that interpretation (Lewandowski et al., 2010). In

completing these initial analyses, two general observations could be made from the descriptive statistics and accompanying box plots.

**Comparison of Findings from All Three Districts.** First, the box plots revealed interesting trends in variability around the median scores when comparing the pre and post-tests within each district. They also highlighted a number of outliers that might have affected those scores. Second, the mean scores from the districts trended higher than those found in the original research from Goh and Richards (1997) (see Figure 9). In their empirical study, Goh and Richards (1997) calculated the mean OLS scores of four different organizations and found that they ranged from  $M=3.51$  to  $M=4.6$ . The pre and post-test scores across all three districts ranged from  $M=4.652$  to  $M=5.679$ .



*Figure 9.* Mean scores on the OLS by district. Across all three districts, the mean scores surpassed those reported by Goh and Richards (1997), indicating the presence of the tenets of organizational learning communities.

Before conducting any inferential analysis to determine whether or not the change in mean scores could be considered significant, the researcher examined the data for normality and homogeneity of variance. Had the data been normally distributed, a



dependent samples paired t-test would have examined the differences between mean scores on the pre and post-tests within each district (Salkind, 2014). However, the data violated two assumptions of the paired t-test (Salkind, 2014). First, the data between the scores was neither normally distributed — as determined by tests of skewness and kurtosis as well as the Shapiro-Wilk test ( $p < .05$ ) for normality — nor homogeneous as indicated by Lavene's Test ( $p < .05$ ). Second, because of participant attrition, the post-test samples were too small to detect a statistical significance. Therefore, a nonparametric Wilcoxon Signed Rank Test sought to determine whether any significant difference could be detected between the pre and post-scores (Salkind, 2014). Table 18 lists the significance values after comparing the pre and post-test scores on the overall OLS scale within each district.

Table 18

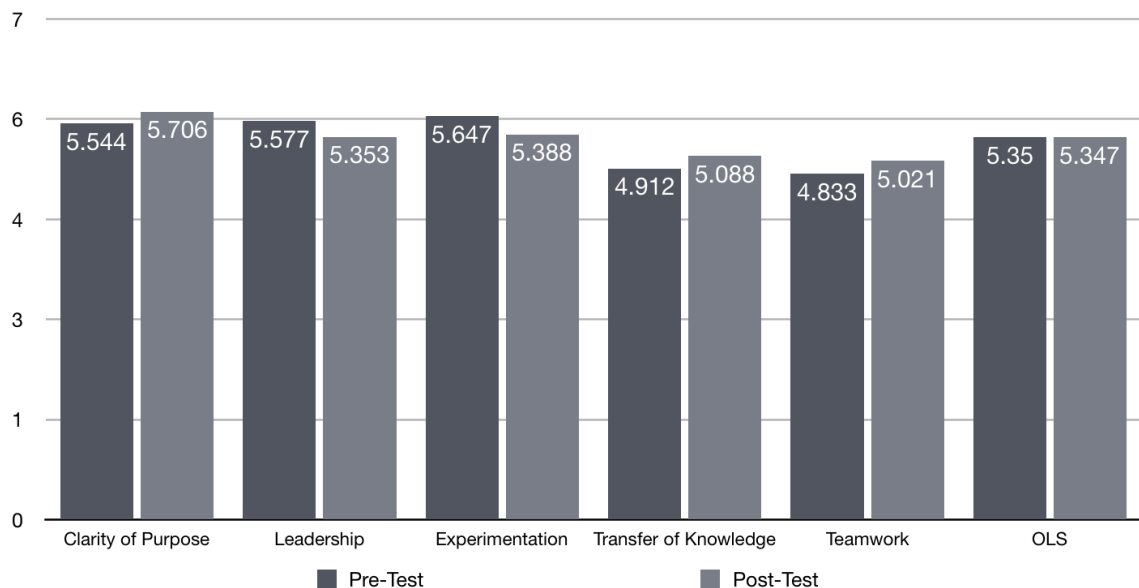
*Wilcoxon Signed Rank Test from the OLS*

OLS Score	Sig.
Bridgetown	.959
Bayview	.169
Hilltop	.670

*Asymptotic significances are displayed. The significance level is .05.*

Despite the lack of statistical significance between the pre and post-tests, the scores from the OLS do offer an insight into the perceptions of the participants. When compared to the scores from the PLCA-R scale (Olivier et al., 2009) analyzed during the needs assessment, they show that the districts tend to perceive themselves as possessing the traits of organizational learning communities. As will be explained in later sections, neither the social network data nor qualitative data collected via the process evaluation support this assumption.

**Organizational Learning in Bridgetown.** Although the Wilcoxon Signed Rank test did not reveal any significant findings between the pre and post-tests in Bridgetown, the descriptive statistics did provide further insight into the district. Much like with the needs assessment scores on the PLCA-R (Olivier et al., 2009), participants rated themselves more positively than the researcher anticipated. In addition to exceeding the OLS scale value reported by Goh and Richards (1997), the mean scores on the sub-scales also trended higher than those reported in the original research. Figure 10 illustrates the distribution of mean scores across the sub scales in Bridgetown.



*Figure 10.* Bridgetown mean scores on the OLS and its sub scales. Average scores surpassed those found by Goh and Richards (1997).

Somewhat surprisingly, two of the sub scale scores — *Leadership Commitment and Empowerment* and *Experimentation* — decreased between the pre and post-tests. To further understand the discrepancy, the researcher used box plots to examine the distribution of scores as well as check for the presence of outliers (Lewandowski et al., 2010). This analysis revealed little about the *Experimentation* sub scale but showed that

several outliers contributed to the decrease in score on the *Leadership* sub scale (see Figure 11).

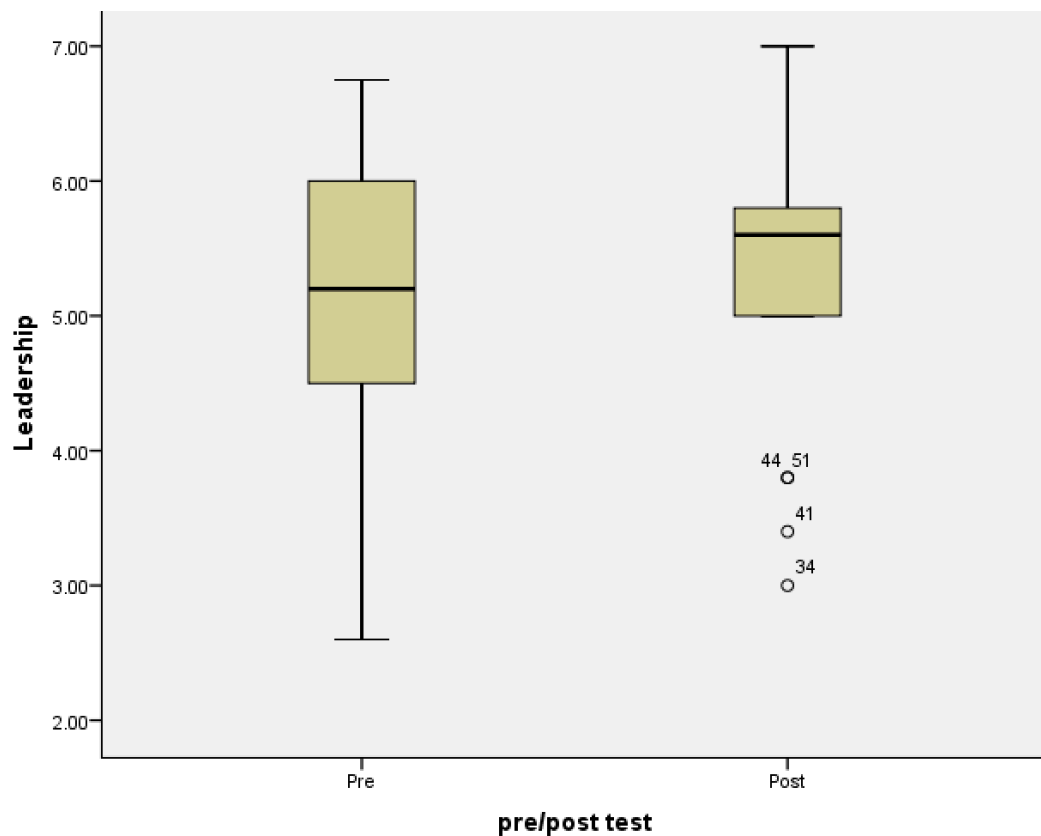


Figure 11. Box plot from Bridgetown Leadership Commitment and Empowerment sub scale. Outliers contributed to the decrease in score from the pre and post-test.

An email received from one of the elementary coaches after completing the post-test provided additional insights.

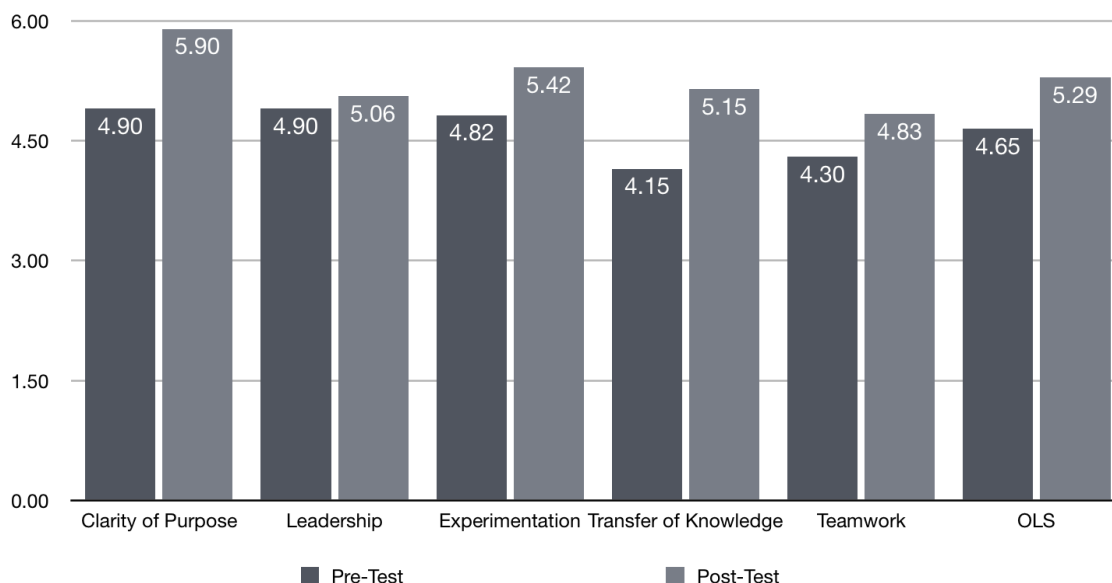
I wish there was a summary section on your survey because I feel like I put *disagree* for a lot of areas. It has only been this year that communication, transparency and feedback is lacking... In prior years, I felt like the communication of goals as well as setbacks were better communicated. There was also flexibility and understanding when determining what works best for teaching

and learning (Bridgetown Elementary Coach, personal communication, January 11, 2018).

Because participants completed the pre-test at the start of the school year, their responses may have reflected perceptions from the previous year. As explained by this elementary coach, those trends did not appear to persist through the intervention.

Two other observations from the process evaluation help to interpret the outcome data. Many of the DLT coaches indicated that they did not feel as though they had the authority to work with others using the digital resources, thereby preventing them from engaging in the activities that would lead to increased organizational learning. Moreover, providing the DLT coaches and admin council with separate sets of resources may have perpetuated structural power dynamics. Bolman and Deal (2008) define structural power as authority based on rules, policies, standards, and organizational structures such as bureaucratic controls. Separating the admin council and DLT coaches not only exacerbated these power dynamics but also decreased the potential for participants to engage in the sociocultural activities that intended to promote organizational learning.

**Organizational Learning in Bayview.** In examining the descriptive statistics, Bayview also posted higher mean scores on the OLS sub scales than originally reported by Goh and Richards (1997). Additionally, the scores indicated an improvement between the pre and post-test conditions for every sub scale (see Figure 12).



*Figure 12.* Bayview mean scores on the OLS and its sub scales. Scores show improvement across all sub scales though the changes were not statistically significant.

Of particular interest, only one of the organizations in the original study by Goh and Richards (1997) had a mean score greater than 4.0 on the *Leadership* sub scale; and yet, both the pre and post-test values for Bayview exceeded that number. According to Goh and Richards (1997), leaders in an organizational learning community should be committed to organizational goals and create a “climate of egalitarianism” (p. 578). Qualitative observations during the check-in meetings seem to indicate a more caustic environment in Bayview.

In reviewing the transcripts, the researcher applied the code *Condescending/Put-Down* 31 times which seems to contradict the definition of leadership provided by Goh and Richards (1997). Two of those instances occurred during the third check-in meeting book-talk. To begin the conversation about The Innovator’s Mindset by George Couros, one of the more senior principals shared his thoughts on the chapter. In response to his contribution, the superintendent replied with,

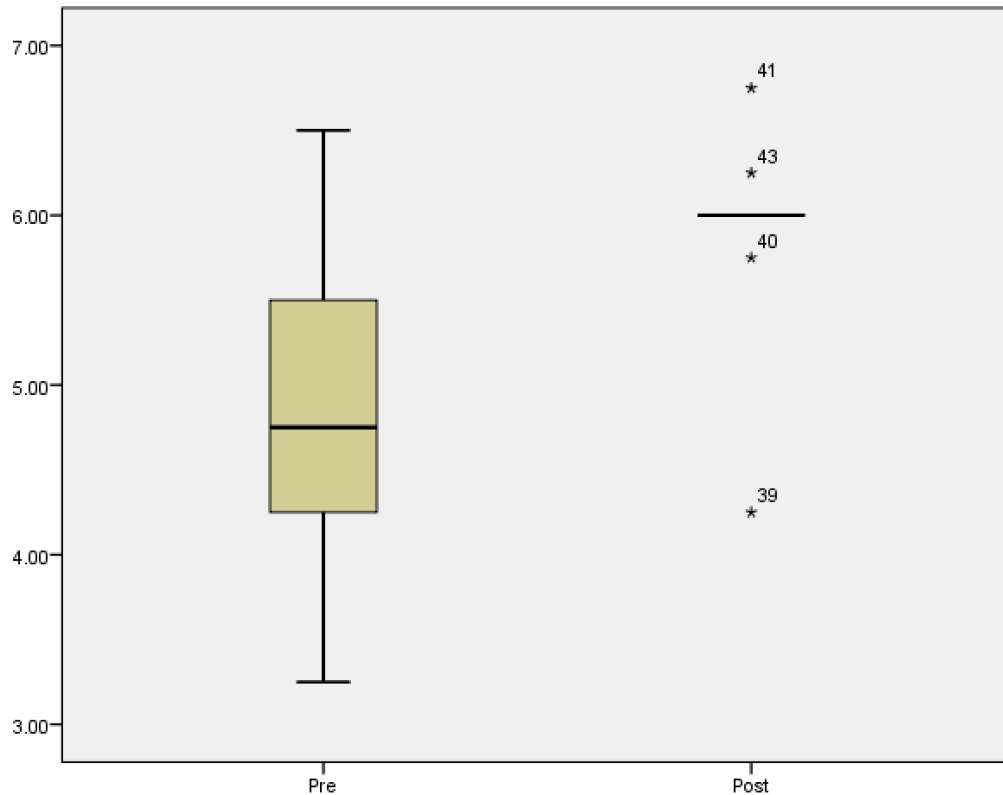
A lot of substance in your answers [person] but I'm saying we all can learn from him. So [principal] has probably sat through more of these superintendent meetings than all of us. So when it comes to reading, I'm just, notice the strategy here and appreciate it... [Principal] jumping out first and answering sort of gets his answer out of the way, establishes that he's at least read some of the highlights here (personal communication, November 16, 2017).

The Superintendent's comments elicited laughter from members of the admin council but appeared to embarrass the principal.

A second exchange occurred when the conversation shifted to the topic of empathy and leadership. The Elementary ELL Coordinator asked a question about how to balance the needs of the students and their families with the beliefs of the teacher. She wanted to know how to employ empathy in this situation. However, one of the high school assistant principals dismissed her question and responded with, "That's leadership... It's what we do every day" (personal communication, November 16, 2017). The superintendent then shifted the conversation in a new direction, essentially disregarding the question.

With an embedded mixed-methods research design, the process evaluation helps to interpret and understand the results of the outcome evaluation (Creswell & Plano Clark, 2011). Therefore, the researcher also viewed the improvement in the *clarity of purpose and mission* mean score with skepticism. Since box plots provide a visualization of the variation in data and can further facilitate its interpretation (Lewandowski et al., 2010), the researcher examined the variance around the median score on the *clarity of purpose and mission* sub scale and discovered that the post-test attrition would not allow

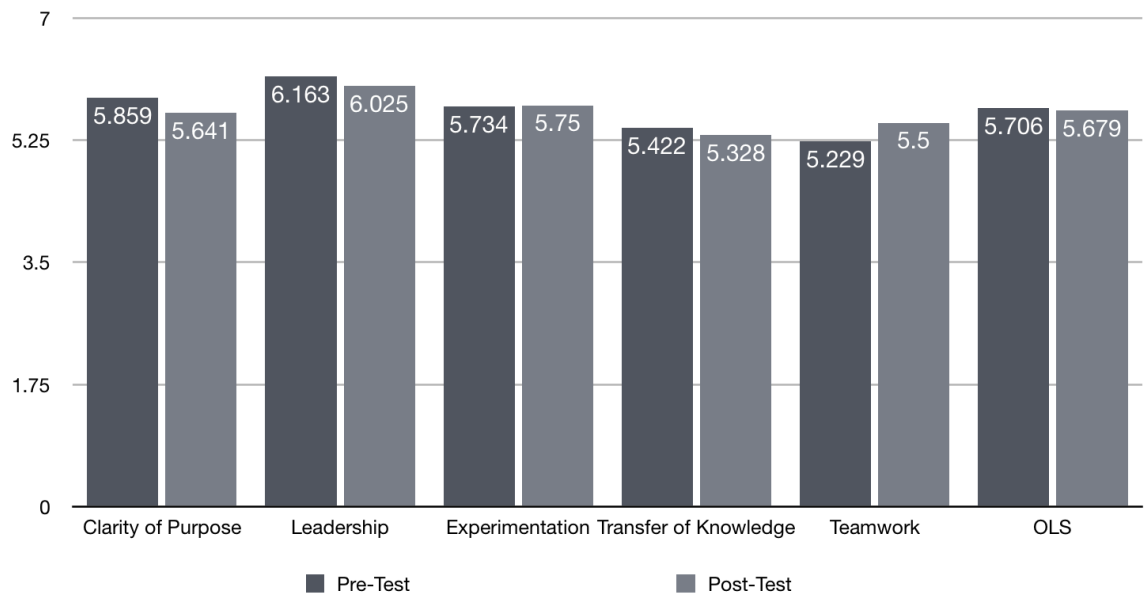
for an accurate comparison (Figure 13). Additionally, given the threats to validity posed by the selection bias that occurred as a result of attrition, the statistic should be viewed critically (Shadish et al., 2002).



*Figure 13.* Clarity of purpose and mission box plot. The asterisks that represent the post-test scores indicate a lack of data to generate a comparison.

Both the quantitative data from the OLS (Goh & Richards, 1997) as well as the data collected from the PLCA-R (Olivier et al., 2009) during the needs assessment seem to imply the presence of a community in Bayview. However, the qualitative observations from the process evaluation contradict that quantitative assessment. Further, as will be described throughout the remainder of this chapter, the underlying political power dynamics (Bolman & Deal, 2008) in the district appear to have affected the participants' responsiveness to the intervention as well as communication patterns detected by the social network analysis.

**Organizational Learning in Hilltop.** Not only were the mean scores in Hilltop higher than those reported by Goh and Richards (1997), but they also surpassed the other districts with one exception: the *clarity of purpose* sub scale on the post-test. Additionally, as illustrated by Figure 14, Hilltop only indicated an improvement in mean scores on two of the sub scale items. Although, the changes between the pre and post-test score on the OLS could not be considered statistically significant based on the results of the Wilcoxon Signed Rank test.



*Figure 14.* Hilltop mean scores on the OLS and its sub scales. Scores show a decline on all but two sub scales though none of the changes could be considered statistically significant.

The above average trend in mean scores on the OLS (Goh & Richards, 1997) mirrored those from the PLCA-R (Olivier et al., 2009) captured during the needs assessment. Based on both of these quantitative analyses, it can be inferred that participants in Hilltop consider themselves members of a learning community that possesses (a) leaders committed to the district's goals; (b) a clearly articulated purpose or



vision; (c) a culture that values learning and experimentation; (d) clear communication that crosses boundaries within the organization; and (e) systems and structures that encourage teamwork and collaboration (Goh & Richards, 1997). However, the qualitative data implies otherwise.

In each check-in meeting, participants stated that the digital resources would be useful when trying to envision strategic priorities, but that they needed to wait for that strategic direction or *clarity of purpose*. The middle school science coordinator explained that “we’re in a holding pattern because we’re trying to come up with new strategic priorities, and we’re kind of waiting on the district to make some decisions around that” (Hilltop Middle School Science Coordinator, personal communication, September 29, 2017). Even the assistant superintendent reported waiting for direction from the Superintendent. This need for authority and control from the central office implies the presence of structural power (Bolman & Deal, 2008) rather than the distributed leadership that characterizes organizational learning communities (Senge & Kim, 2013).

Further, a learning community would include a culture that values learning and experimentation, communication, as well as collaboration and teamwork (Goh & Richards, 1997). And yet, *trust* emerged as one of the most frequently employed qualitative codes when analyzing the process data. In addition to the high school coordinators and assistant superintendent not trusting others to see their thinking in the digital resources, the elementary and middle school coordinators stressed the need for anonymity.

On the contrary, the researcher noted that within the elementary and middle school groups, the coordinators felt comfortable and trusted each other. While there may

not be the presence of an organizational learning community across the entire district, the researcher noted that tenets may be in existence within these two micro-communities. As will be explained throughout the rest of this chapter, these two groups used the prompts within the digital resources to engage in the sociocultural activities as intended by the design of the intervention. They just did not use the resources in their digital form or in communication outside of their immediate micro-community.

**Districts' Capacity for Organizational Learning.** The lack of statistical significance between the pre and post-test scores on the Organizational Learning Survey (OLS) (Goh & Richards, 1997) did not surprise the researcher. Given the analysis of the qualitative data from the process evaluation, the researcher expected to detect a decrease in scores rather than an increase. In a study of schools within a Charter Management Organization in Southern California, Moolenaar et al. (2014) found a correlation between the relative seniority of the faculty with their positive perceptions of innovation. Therefore, the researcher surmised that the relatively high scores on both the OLS (Goh & Richards, 1997) and the PLCA-R scale (Olivier et al., 2009) from the needs assessment could be attributed to the relatively long tenure of the participants within their districts. Regardless, though the quantitative data appeared to indicate the existence of the tenets of organizational learning communities within each district, the qualitative data did not support any inferences that the intervention might have improved the districts' capacity for organizational learning.

### **Language Used to Describe Innovation**

The needs assessment conducted in chapter two revealed that participants did not share a common language to describe innovation of classroom practice to prepare

students for the knowledge economy. Respondents referenced concepts such as *21<sup>st</sup> Century Skills*, Dr. Ruben Puentedura's SAMR model, as well as the *Future Ready* initiative; and yet, little consistency in language emerged within the districts. Additionally, participant responses did not align to the districts' published technology or strategic plans.

According to the logic model described in the previous chapter (Figure 4), as participants engaged with the digital resources, they would participate in the sociocultural activities of joint work, boundary spanning, and brokering (Honig, 2008; Honig, 2012, Honig & Rainey, 2014; Swinnerton, 2007). Completing these activities would improve the quantity and quality of communication and thus support the development of common language. To determine whether the language used by participants did change as a result of using the digital resources, pre and post-test surveys included an open-response question to elicit definitions of innovation from participants. Because of the low response rate to that specific question, as well as the attrition in each district, the researcher chose to exclude this data. Instead, the researcher examined the qualitative data collected during the process evaluation to better understand the language used by participants.

**Language for Innovation in Bridgespan.** When the Superintendent, Assistant Superintendent, and Director of Educational Technology introduced the intervention to their colleagues, they framed it as an opportunity to support the district's work with the *Future Ready* initiative from the Office of Educational Technology (U.S. Department of Education, 2016). The *Future Ready* program promotes the idea of *personalized learning* and technology integration as its vision. Therefore, when asked to define innovation of

classroom practice to prepare students for the knowledge economy on the pre and post-test surveys, several participants referenced either *Future Ready* or *personalized learning*. Nonetheless, as evidenced through analysis of the digital resources, members in the district could not articulate how this vision may manifest within their context.

Throughout the intervention, the Director of Educational Technology encouraged the principals and DLT coaches to use the *Essential Improvements* resource to construct a definition of *personalized learning* specific to their context. The *How might we make a change in environment, behavior, and/or beliefs to improve student learning?* prompt within the *Essential Improvements* resource did elicit a range of responses. One coach from elementary building 3 focused on a specific activity: “presenting weekly word sorts using google slides... at the needs of the students at almost an individualized level” (Bridgetown elementary coach, personal communication, December 12, 2017). Others referenced the need for easier access to devices, the need to use SeeSaw (a web-based journal), and the challenges associated with elementary students having to remember usernames and passwords to access *personalized learning apps*. An email exchange with the Director of Educational Technology revealed that even he did not possess the language to articulate a clear understanding of *personalized learning*.

[I am] thinking of honing in on our districts definition and vision of personalized learning. We did a lot of initial work on it, but [it] has not really been communicated well or internalized by staff... Coming to terms on this may also help weave in all of the other focus areas for the district (personal correspondence, October 19, 2017).

In addition to review of the *Essential Improvements* resource, conversations with members of the admin council and observations conducted during the face-to-face meetings confirmed that little shared understanding existed in the district. Instead, leaders relied on the use of symbolic language — words that carry meaning and create the appearance of legitimacy (Bolman & Deal, 2008) — to appear innovative. By using the language from the *Future Ready* initiative, leaders could create a pretense of innovation without describing any real pedagogical change that would lead to preparing students for the knowledge economy.

**Language for Innovation in Bayview.** Like Bridgespan, Bayview also relied on symbolic language (Bolman & Deal, 2008). Analysis of the Bayview technology plan during the needs assessment uncovered an extensive vision statement with references to a number of initiatives. When mentioning this plan during the initial training session for the intervention, not a single person — including the Superintendent and Assistant Superintendent — admitted to having read it.

Throughout the intervention, the process evaluation revealed that the participants in Bayview also relied on symbolic gestures — words and activities that carry implied meaning (Bolman & Deal, 2008) — such as those in the technology plan. For example, other than a single conversation with the Assistant Superintendent during recruitment about their new personalized learning program, no one ever mentioned it. Moreover, the district had started a district capacity project the previous year, and yet when asked what that entailed, the Assistant Superintendent could not recall the specific initiatives. The Union President wrote the following reflection in the *Essential Improvements* resource after a conversation about the district capacity project: “Everything we read together

about leading change of any kind talks about ‘buy in,’ ‘agency,’ or elevating voice, but we do no more than lip service” (personal communication, October 19, 2017).

After reviewing all of the transcripts from the check-in meetings, it became apparent that not a single conversation addressed student learning or classroom practice. In Bayview, participants talked around issues that ranged from *social emotional learning*, to *keys to literacy* (a note taking initiative), to the implementation of maker spaces, but without ever defining the purpose or intention for the program. Even in their discussion of *The Innovator’s Mindset*, participants never spoke concretely about students and teachers. As the Union President noted in her comment, there seemed to be lots of talk but little action.

**Language for Innovation in Hilltop.** Whereas Bridgetown and Bayview relied on symbolic language (Bolman & Deal, 2008) to create the perception of innovation, several groups of participants in Hilltop used the digital resources to improve their language of pedagogy. Though the researcher had intended that participants would employ the *Technology for the Purpose Of...* resource to address the tenets of deeper learning, personalized learning, and authentic learning (McLeod, 2015), participants in Hilltop used the *Polarity Map* instead. In each instance, they leveraged the resource to better communicate the purpose and intent behind their use of pedagogical language.

First, the Assistant Superintendent wanted to deconstruct the concept of social emotional learning so that it would be viewed as part of a broader district effort and not a single *passion-project* led by an individual. To define social emotional learning and articulate how it might play out within broader district strategic planning efforts, the Assistant Superintendent worked through the *Polarity Map* to define the greater purpose

of the initiative and then identify ways to then communicate the intent to the other leaders. Next, the elementary school coordinators used the *Polarity Map* to build language around their reading curriculum. Throughout the first half of the intervention, they used that resource to more deeply understand resistance to the idea of a scope-and-sequence for reading instruction. Initially, they assumed that the act of creating a reading scope-and-sequence served as the *greater purpose* that they hoped to achieve. However, when working with the *Polarity Map* during the second check-in meeting, the coordinators realized that their real objective was to build shared language so that they could more effectively collaborate and discuss learning interventions for students.

The elementary school coordinators continued to focus on the idea of language as they designed curriculum around a new science program. Instead of addressing discrete lesson designs or content areas, they focused on what they called “science practices” and the language of investigation. Returning to the *Polarity Map*, they independently identified questioning and inquiry as the greater purpose for their science initiative and then started to identify ways that they could scaffold those tenets across the curriculum. Finally, the middle school coordinators defined every term that they employed in their conversations - whether discussing the redesign of the science curriculum to embrace more inquiry, heterogeneous groupings in math with a focus on differentiation, or clearly articulating the intent of a strategy such as Project Based Learning.

Throughout the intervention, both the middle and elementary school coordinators described inquiry, problem solving, and critical thinking as crucial components of *innovative* learning environments. On the one occasion that technology entered into the conversation with the elementary school, it was in support of creating inquiry-based

experiences through virtual field trips and video-conferencing. In contrast, the high school coordinators only discussed student learning, pedagogy, and innovation during one conversation. At that time, they lamented the lack of technology skills that they perceived in their students. Unfortunately, as will be discussed in the next section, little communication occurred between the elementary, middle, and high school divisions in Hilltop to share conversations about teaching, learning, and pedagogy.

**Common Language to Describe Innovation.** In designing this intervention, the researcher had intended for participants to develop shared language to describe innovation of classroom practice to prepare students for the knowledge economy. By creating the *Technology for the Purpose Of...* resource, she had hoped that coordinators, coaches, and principals would engage in conversations about deeper learning, personalized learning, and authentic learning as well as how technology might support changes in practice to achieve those tenets. However, these conversations never occurred.

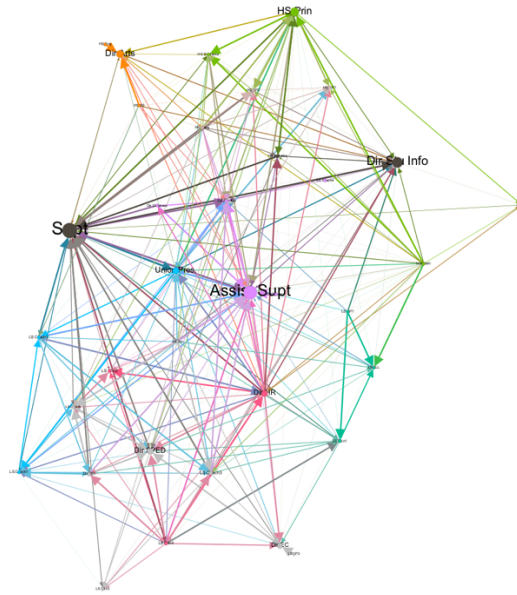
In Bridgetown and Bayview, participants used symbolic language (Bolman & Deal, 2008) to create an appearance of innovation. When asked to further define their thinking around initiatives such as *personalized learning* they used ambiguous terms and pointed to symbolic gestures such as the creation of a makerspace. Conversely, the Assistant Superintendent as well as the elementary and middle school coordinators in Hilltop regularly worked to build shared language around specific topics such as math, reading, science inquiry, and social-emotional learning. Though these conversations may not have addressed technology, innovation, or developing students' knowledge economy skills, they did illustrate the positive effects of shared language within a community of educators.



## Quantity and Quality of Communication

According to the theory of treatment, using the digital resources should have encouraged participants to engage in the sociocultural activities of joint work, boundary spanning and brokering (Honig, 2008; 2012; Honig & Rainey, 2014; Swinnerton, 2007). These activities would then improve the quantity and quality of communication within the district and thus effect the development of shared language and organizational learning capacity. Pre and post-tests using the School Staff Social Network Questionnaire (SSSNQ) from Pitts and Spillane (2009) examined the communication patterns as well as the quality of interactions between individuals to help answer the research question: *how did engaging in the sociocultural activities with the resources effect communication between the participants within their districts?*

The SSSNQ asks participants to identify the individuals from whom they seek advice about innovation of classroom practice and to rate the level of perceived influence associated with that advice using a 5-point Likert-scale that ranged from *Not at all Influential* to *Very Influential*. After importing this data into a social network analysis tool (Gephi 0.9.2), the researcher calculated a number of statistics to generate sociograms such as the one presented in Figure 15. These visualizations of the social network data, when combined with the qualitative data from the process evaluation, elucidate the how communication and language flow through the ecosystems of the districts.



*Figure 15.* Example sociogram. Arrows indicate the direction of the communication. Colors show different statistical communities. The width of the edges (lines) correspond to the level of influence as indicated by the Likert-scale items.

**Statistical Analysis of the Districts’ Networks.** The statistical analyses conducted on the SSSNQ data provide an overview of the social networks within each district and generated the sociograms as graphical outputs. When combined, the statistics and sociograms allow for a deeper understanding of the differences in the communication structures between the three districts as well as the changes between the pre and post-test conditions. Because of the high levels of attrition, Table 19 presents the pre and post-test data as well as a column for pre-test (attrition).

Table 19

*SSSNQ – Network Architecture Statistics*

	Pre-Test	Pre-Test (Attrition)	Post-Test
Bridgetown			
Average Degree	8.6	2.765	5.919
Average Path Length	2.344	1.777	1.632

Network Diameter	5	3	3
Bayview			
Average Degree	8.629	1.943	2.581
Average Path Length	1.815	1.648	1.365
Network Diameter	5	4	4
Hilltop			
Average Degree	7.089	3.723	3.75
Average Path Length	2.118	2.079	1.784
Network Diameter	4	4	3

The pre-test (attrition) column uses the pre-test data but excludes all participants who did not complete the post-test survey. By creating a matched sample, it became possible to make more realistic pre and post-test comparisons between the same groups of people (Henry, 2010). The researcher uses these statistics to discuss and compare the network architectures of each district in the following sections.

***Comparison of Network Architecture Across the Districts.*** With social network analysis, *nodes* represent individuals and *edges* indicate the communication path (Gephi, n.d.). A *degree* then refers to the total number of edges that touch a node (Gephi, n.d.). The *average degree* calculation takes the total number of degrees within the network and then divides that number by the sample size. Because of the large amounts of attrition between the pre and post-tests, the pre-test sociograms included more nodes and edges than the post-test because of the larger sample size. Additionally, the average degree statistic for the pre-test in each district was substantially higher than the post-test because more participants completed the pre-test survey. Therefore, to examine changes in quantity and quality of communication, the researcher compared the pre-test (attrition) and post-test data so that the analysis examined the same samples of participants.

Though the average degree in Hilltop remained relatively consistent between the pre-test (attrition) and post-test samples, changes could be observed in Bridgetown and Bayview. When comparing this statistic from Table 19 to the sociograms (Figures 16 and 17), it becomes apparent that the participants in Bridgetown and Bayview made more connections within their networks between the pre and post-test environments than the individuals in Hilltop. Since this intervention sought to increase the quantity of communication throughout the districts, this number indicates that the individuals in Bridgetown and Bayview connected with more of their colleagues during the time of the intervention — an inference supported by the sociograms.

In addition to determining the average number of connections between individuals, the SSSNQ captured *directional* data about those interactions. When an individual indicated that they sought advice from another person, that interaction was represented as an *out-degree*. When examining the sociograms, an out-degree is represented as an arrow coming out of a node. Conversely, the node representing the person with whom they communicated then became an *in-degree*.

Further, the qualitative data collected from the Likert-scale questions determined the weights of the edges. Participants rated the level of influence of each interaction on a 5-point Likert scale. A thicker edge represents a more influential interaction, and a thinner edge infers that the interaction is less influential. Though both Bridgetown and Bayview showed an increase in average degree between the pre and post-tests, participants in Bayview rated their interactions as more influential.

***Comparison of Network Centrality Across the Districts.*** Centrality refers to how specific nodes may be positioned within the network architecture as well as the

relationship of the nodes to each other (Gephi, n.d.). Larger, more centralized nodes represent individuals with more connections (Gephi, n.d.). To examine the centrality of the networks, the researcher first used Ulrik Brandes' (2001) algorithm in Gephi to determine the average path length for each sociogram. This computation determined the length of the edges between all possible pairs of nodes and then calculated the distance between each node. For example, two immediately connected nodes would have a path length of one; however, two nodes connected through another person would have a path-length greater than one (Brandes, 2001). As such, the diameter of the social network equals the longest distance between two nodes (Gephi, n.d.). As indicated by Table 19, across all three sites, the average path-length decreased between the pre-test (attrition) and post-test samples, indicating that the individuals in the networks became more closely connected.

Additionally, the Brandes (2001) algorithm determined the *betweenness centrality* for each node. This statistic indicates the frequency with which a node appears on the path between two other nodes (Brandes, 2001). Nodes with a higher betweenness centrality appear larger on the sociograms. When creating the sociograms, the researcher scaled the node sizes by this statistic to more clearly illustrate the relative position of individuals within the networks (Gephi, n.d.). A higher betweenness centrality indicates that the node plays a more central role in the communication network. With the pre-test data in particular, the Assistant Superintendent in all three districts possessed the largest measure of betweenness centrality. Not only did they have a high number of connections, but they were also positioned towards the center of the networks. This trend continued with the post-test data for the Assistant Superintendents in Bridgetown and Hilltop.

Because the Bayview Assistant Superintendent did not complete the post-test survey, his betweenness centrality measure dropped, and his position within the network shifted towards the perimeter.

In combination, the statistics of average path length, diameter, and betweenness centrality can all be used to understand the overall *centrality* of the social networks.

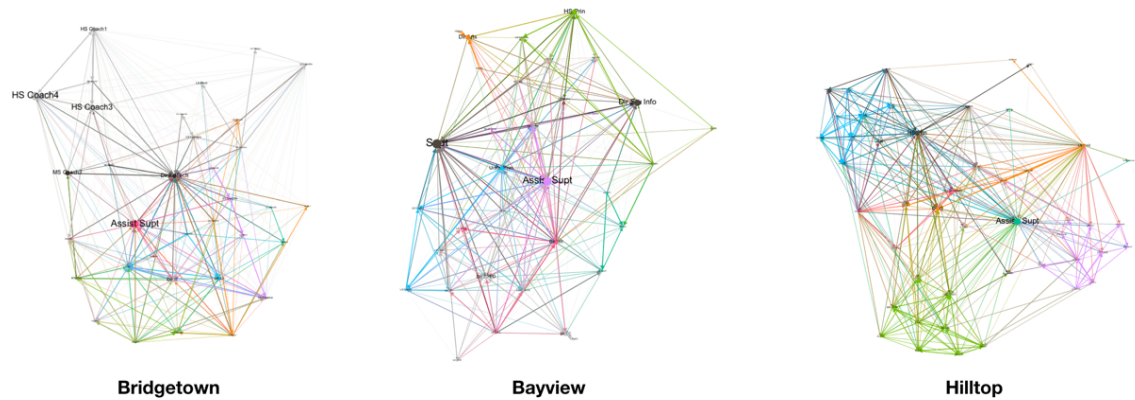
According to Barnes, Goertz, and Massell (2014), centrality shows the relative importance of individuals within the network. This importance could either indicate a position of power and authority or one of brokering and boundary spanning (Barnes et al., 2014). When looking across the three districts, it became apparent that much of the communication remains centralized within the district leadership.

***Network Communities within the Districts.*** The modularity algorithm (Blondel, Guillaume, Lambiotte, & Lefebvre, 2008) identified statistical communities as displayed by the sociograms. The algorithm examined the degrees associated with each node as well as how those nodes relate to each other (Blondel et al., 2008). Given the relatively small sample size, the researcher set the modularity class to 0.5 for smaller community detection per the recommendation from Lambiotte, Delvenne, and Laplacian (2009). Each color on the sociograms then indicates a different statistical community based on the calculations of the algorithms (Blondel et al., 2008; Lambiotte et al., 2009). The researcher used modularity class communities to detect the presence of micro-communities that communicated and collaborated within the districts as well as potential coalitions or factions that may thwart communication throughout the network.

When examining the statistical data from the modularity class algorithm (Blondel et al., 2008) across the three districts, distinct patterns emerged. In Bridgetown, the

algorithm detected more communities than in the other districts. Additionally, each of these communities consisted of a smaller percentage of nodes than in Bayview or Hilltop. When analyzed in conjunction with the edge weights, it could infer that individuals within the district did not seek as much input from colleagues. Conversely, though the pre-test sample detected eleven communities in Bayview, the pre-test (attrition) and post-test samples only found seven. As will be discussed, the sociograms and qualitative data reveal that these statistical communities could be described as coalitions rather than opportunities for communication and collaboration. Finally, the statistical analysis detected the fewest number of communities in Hilltop. Unlike the other districts, the sociograms then illustrate that the communities closely align to the divisions of the district (elementary, middle, and high school). The qualitative data confirms this observation.

**Pre-Test Findings Across Districts.** Despite the similarity in scores between the three districts on the OLS (Goh & Richards, 1997) and PLCA-R (Olivier et al., 2009) from the needs assessment as well as the statistical analysis of the social network data, the sociograms illustrated incredibly different communication structures within each site. Figure 16 presents a comparison of sociograms across the three sites based on the pre-test analysis of the SSSNQ data.



*Figure 16.* Sociograms from pre-test data. The colors indicate the presence of communities; the node size shows the betweenness centrality; and the widths of the edges indicate level of influence.

These pre-test sociograms revealed key details about each district. Though Bridgetown appears to have similar traits as the other districts based on the statistics presented in Table 19, the colors on the sociogram illustrate the percentages generated by the modularity class algorithm and show that clearly defined communities do not exist. Further, the presence of thin edge weights (calculated from the SSSNQ Likert-scale scores) indicates a less-influential network when compared to Bayview and Hilltop. An open-response question on the SSSNQ asked participants to think more generally about their social networks and list any other individuals to whom they seek advice about innovation. Forty-five percent of participants in Bridgetown listed individuals from outside of the district as compared to 25% in Bayview and 11.9% in Hilltop, indicating that they may seek advice from outside of their district rather than from within.

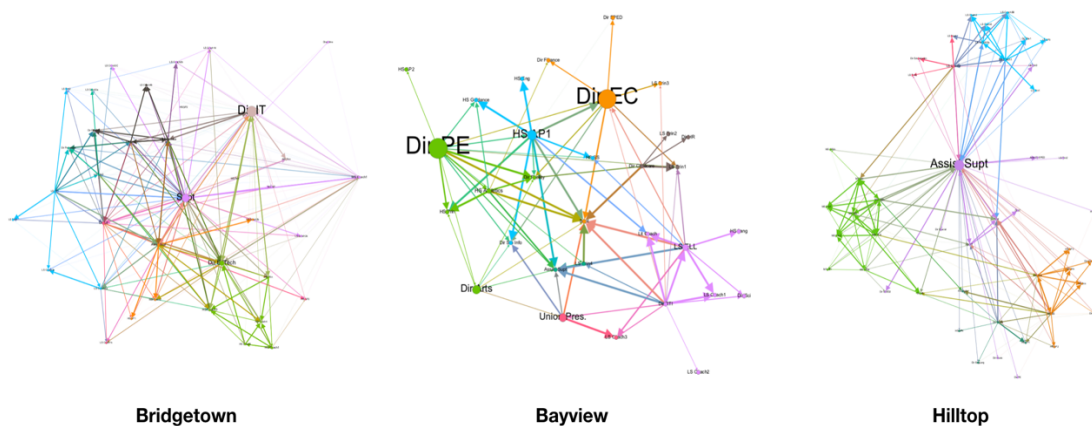
In Bayview, the sociograms indicate that communication is highly centralized in the central office. Both the Superintendent and Assistant Superintendent have high in-degrees (indicated by the number of arrows pointing to them); and yet, they also appear to exist in different communities based on the colors generated by the modularity class



algorithm. As will be explained later in this section, Bayview had a number of coalitions and alliances within the admin council. These alliances can be detected by the colors in the sociograms and corroborated by the qualitative research.

Finally, three distinct communities — the high school, middle school, and lower school divisions — define the community structure in Hilltop. Additionally, the new Assistant Superintendent exists as a node in a high out-degree community, meaning that the statistical community emerged as a result of her advice seeking. The qualitative data captured during the process evaluation further explains these different relationships.

**Post-Test Findings Across District.** Given the attrition that occurred, the pre-test data may be indicative of the overall network structures within the districts. However, comparison of the post-test sociograms (see Figure 17) reveals additional information about the dynamics within the districts themselves.



*Figure 17.* Sociograms from post-test data. The colors indicate the presence of communities; the node size shows the betweenness centrality; and the widths of the edges indicate level of influence.

Since Bridgetown had the least amount of attrition between the pre and post tests, their network possesses a higher average degree and appears to have the most connections. However, like with the pre-test, those connections do not appear as

influential as the other districts based on the edge weights. On the contrary, not only does Bayview have fewer communities in the post-test sociogram than the pre-test, but the larger nodes represent higher out-degrees which implies more active communication. Since the Superintendent and Assistant Superintendent did not complete the post-test survey in Bayview, they appear significantly smaller on the post-test diagram than the central office administrators in the other districts. Interestingly, with the Hilltop sociogram, the elementary, middle, and high school divisions become even more pronounced with the post-test data. The Assistant Superintendent also moved closer to the center of the network.

The final question of the SSSNQ (Pitts & Spillane, 2009) asked participants to rate their satisfaction with the availability of advice within their network on a 5-point Likert Scale that ranged from *Not at all satisfied* to *Very satisfied* (see Table 20).

Table 20

*SSSNQ – Satisfaction with the Availability of Advice (Mean Scores)*

	Pre-Test Mean	Post-Test Mean
Bridgetown	3.89	3.67
Bayview	3.44	4.00
Hilltop	3.86	4.00

On the pre-test, the mean score for all three districts implied that participants were satisfied with the available networks. However, the mean scores increased in Bayview and Hilltop on the post-test and decreased in Bridgetown. When comparing this data to the sociograms, it helps to explain the edge weights across districts. Though Bayview had the fewest nodes and connections, participants rated those connections as moderately to very influential. Within Hilltop, strong connections appeared within the divisions but

not across them. Bridgetown might have possessed the most number of connections as calculated by the average degree, but participants did not appear to value them as strongly.

**Qualitative Dynamics of Social Networks Across Districts.** The qualitative data captured via the digital resources, face-to-face meetings, and external communication (phone calls and emails), not only illustrated how participants used the digital resources to engage in the sociocultural activities but also the presence of power dynamics that appeared to thwart the communication that the intervention intended to encourage. In their case study, Jaeger, Grantham, and Lynch (2014) explain that the theories of Bolman and Deal (2008) can be used as lenses or frames to understand power and organizational dynamics. Similarly, O'Connell, Hickerson, and Pillutla (2011) argues that subjective frames like political or symbolic power can be made salient through lenses such as those presented by Bolman and Deal (2008). Therefore, the researcher applied the frames of political, structural, symbolic, and human resources (Bolman & Deal, 2008) as descriptive codes (Saldana, 2009) to understand the power dynamics that emerged through qualitative analysis.

During the second cycle of coding, the researcher grouped codes into themes as well as quantitized (Teddlie & Tashakkori, 2003) coding patterns to make comparisons across districts. For example, the theme of *power* included the codes *political*, *symbolic*, and *structural* based on the literature from Bolman and Deal (2008) in addition to *time* (Willower, 1991) and coherence (Elmore et al., 2014; Mourshed et al., 2010). Table 21 provides an overview of the most frequently employed qualitative codes within each district. The theme of the sociocultural activities included joint work (Daly & Finnigan,

2010; Honig, 2008;2012; Honig & Rainey, 2014), boundary-spanning (Honig, 2008; Swinnerton, 2007), and brokering (Honig, 2012; Spillane & Kim, 2012; Swinnerton, 2007) as well as the emergent code of *protocol* to describe how the coordinators in Hilltop used the resources as verbal protocols to support the sociocultural activities.

Table 21

*Cross-District Comparison of the top Descriptive Codes by Related Theme*

Theme	Bridgetown	Bayview	Hilltop
Power	Symbolic (4.4%)	Symbolic (13.3%)	
	Structural (4.2%)	Structural (4.2%)	Structural (3.7%)
	Political (3.4%)	Political (10.7%)	Political (9.2%)
	Time (2.2%)	Time (4.4%)	Time (2.8%)
	Coherence (2.7%)	Coherence (3.4%)	Coherence (2.6%)
	Human Resources (3.9%)	Human Resources (4.6%)	
		Condensing/Put-Down (5.0%)	
Sociocultural Activities		Resistance-Consensus (2.3%)	
		Change (2.8%)	
			Trust (2.6%)
	Joint Work (3.5%)		Joint Work (3.1%)
	Boundary Spanning (3.2%)		
			Protocol (2.9%)

When compared to the sociograms, the qualitative data reveals additional trends when looking across districts. Though the intervention intended to encourage the sociocultural activities, the process evaluation revealed more instances that could be described as manifestations of power than positive communication. As discussed in the previous sections, and will be further explained in the discussion section, the power dynamics within the districts affected the participants' desire and ability to communicate. Most notably, codes associated with the theme of power dominated the list for Bayview and none of the codes for the sociocultural activities (e.g. joint work, boundary spanning, or brokering) appeared. This does not mean that the activities never occurred in that district, but they did so less frequently than demonstrations of symbolic, political, and structural power.

By comparison, *joint work* appeared in both Hilltop and Bridgetown. Much of the collaborative work that occurred between the middle and lower school coordinators in Hilltop could be described as joint work - work that all parties find mutually beneficial (Honig, 2008;2012; Honig & Rainey, 2014). For example, one of the lower school coordinators described how using the *Think-Feel-Care* resource helped them to plan a successful professional development experience for their teacher colleagues.

In Bridgetown, *boundary-spanning* emerged as a top code. According to Swinnerton (2007), boundary-spanning describes the process of carrying information between nodes in the system and engaging in bi-directional communication. The Director of Educational Technology regularly navigated between the central office administrators, principals, and DLT coaches. His central position and high in-degree represented by the sociograms corroborates this observation. Data captured through the

*Essential Improvements* resource also indicated that the middle school coaches began boundary-spanning within their buildings, and the sociograms reinforce this interpretation as it illustrates their out-degrees. Throughout the case studies in the following sections, the researcher triangulates the quantitative findings from social network analysis with the qualitative data captured during the process evaluation to present rich descriptions of the participants' actions during the intervention (Martinson & O'Brien, 2010).

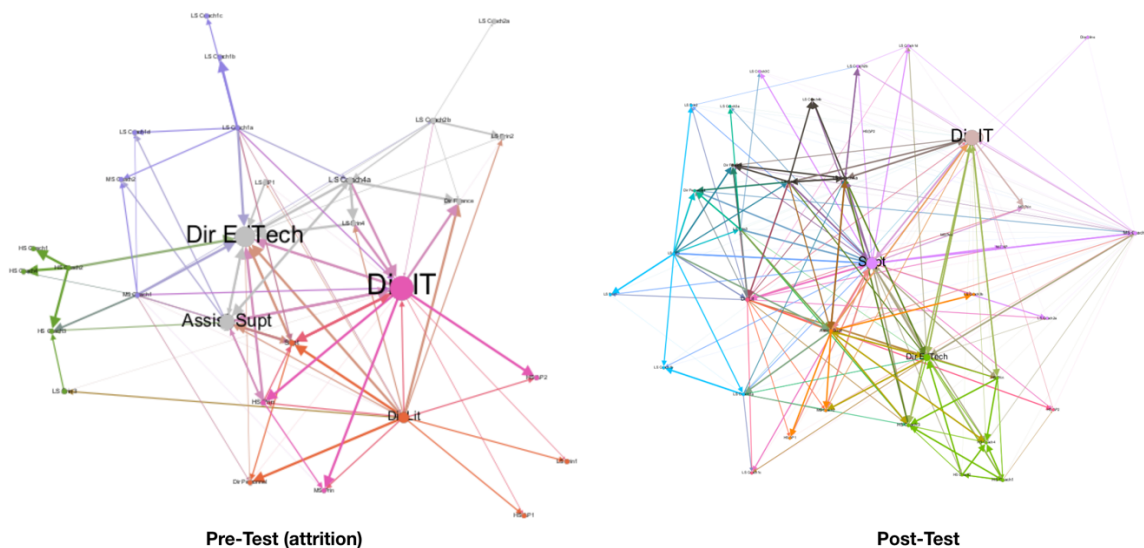
**Communication Dynamics in Bridgetown.** The qualitative data from the process evaluation in Bridgetown revealed that the sociocultural activities only occurred sporadically during the intervention. As mentioned in the previous section, the Director of Educational Technology consistently attempted to play the role of boundary-spanner (Swinerton, 2007). He navigated between the layers of the organization communicating with the DLT coaches, principals, and other central office administrators. While this intended to support communication, he found that conversations revealed animosity rather than collaboration. On a phone call, he explained that he had been directed to allow the principals to manage the DLT coaches. As a result, he perceived that little progress had been made as the principals expressed resentment about the DLT coaching program and his involvement with "their teachers" (personal communication, October 13, 2017).

The DLT coaches expressed frustration with both the principals and the other teachers when attempting to engage in joint work or boundary-spanning. In the *Essential Improvements* resource, the coaches discussed the challenge of getting direction from the principals as well as lack of willingness from their colleagues. As one elementary coach commented,

I am beginning to feel that this may have to be put on the back burner for a while... To many teachers, letting students in k-2 be creative in various ways involving technology is an unwelcomed added “task” and very much uncharted waters (personal communication, December 11, 2017).

One of the middle school DLT coaches commented that her colleagues lacked the motivation to try new instructional strategies and that the principal had not made innovation a priority.

Analysis of the sociograms generated from Pitts and Spillane’s (2009) SSSNQ provides insights into the communication patterns that contributed to these sentiments. Though the pre-test network in Bridgetown appeared similar to those of the other districts based on the statistical analysis, the sociograms revealed that participants rated their connections as less influential. The thinner edge weights, calculated from the Likert-scale questions, indicated the presence of less influential connections. Given the amount of attrition between the pre and post-test samples, the researcher created a sociogram using the pre-test sample and data but excluding the participants who did not complete the post-test in order to make comparisons and observations between the pre-test (attrition) and post-test environments (see Figure 18).



*Figure 18.* Bridgetown sociograms for pre-test (attrition) and post-test samples. Comparison of the sociograms shows an increase in average degree and shift in centrality but not an improvement in influence.

The sociograms reveal a more centralized structure rather than a distributed network. Both the Director of Educational Technology and the Director of IT emerged as central figures in the advice-seeking networks of both the pre-test (attrition) and post-test samples. The pre-test (attrition) social network analysis also placed both the Superintendent and Assistant Superintendent towards the center of the network.

Interestingly, most of the principals exist as nodes on the periphery of the network except for the high school principal. However, in the pre-test (attrition) network, the high school principal is not connected to the high school DLT coaches, and they do not appear to be seeking advice from her. When examining the differences between the pre-test (attrition) and post-test networks, the high school principal appeared towards the center of the network and indicated new connections with the high school DLT coaches. A community also appears to have formed between these high school nodes and the Director of Educational Technology. During a phone call, the Director of Educational



Technology commented that the high school principal had been the only one to proactively connect with her DLT coaches.

When comparing the pre-test (attrition) and post-test environments, the Superintendent showed the greatest change in position. The post-test analysis indicated that he now possessed a higher number of out-degree connections with the principals, denoting stronger ties to more of the building leaders in the network. From this analysis, it could be inferred that the Superintendent had started to engage in brokering — communicating policy intentions throughout the nodes in the network (Spillane & Kim, 2012) and negotiating responsibilities to ensure that individuals stay on task to achieve those objectives (Honig, 2012).

After the first check-in meeting, the Superintendent used the *Essential Improvements* resource to identify changes to improve learning. In response to the *how might we make a change in environment, behavior, or beliefs* prompt, he wrote that he would like to “Empower cabinet members [this includes principals] to be problem solvers/solution seekers in order to address needs in teaching and learning” (personal communication, October 24, 2017). Further, at the conclusion of the last check-in meeting, he explained to the DLT coaches that he hoped they would “build common language and beliefs to progress with our *Future Ready* work” (personal communication, December 12, 2017). This qualitative data, when triangulated with the social network analysis, supports the assumption that the Superintendent had begun to assume responsibility for brokering within the district.

Regardless of these instances of engaging in the sociocultural activities, and the relatively high scores on the OLS (Goh & Richards, 1997), the district appears to be

operating more as a traditional bureaucracy characterized by centralized communication and power. Both the pre-test and pre-test (attrition) samples detected 12 distinct modularity class communities, and the percentage of participants in each community ranged from 2.86-17.75%. Though the post-test sample analysis detected 10 communities with 2.7-21.62% of the participants in each one, the highest percentage community surrounded the Superintendent. This represents a considerable change in structure from the pre-test (attrition) sample towards even more centralized communication. According to Daly et al. (2014), social networks illustrate the flow of communication through an organization and the position of leaders in the network. Within Bridgetown, the central office administrators remain the primary conduits of information in the district, potentially perpetuating a top-down flow of information and a hierarchical structure.

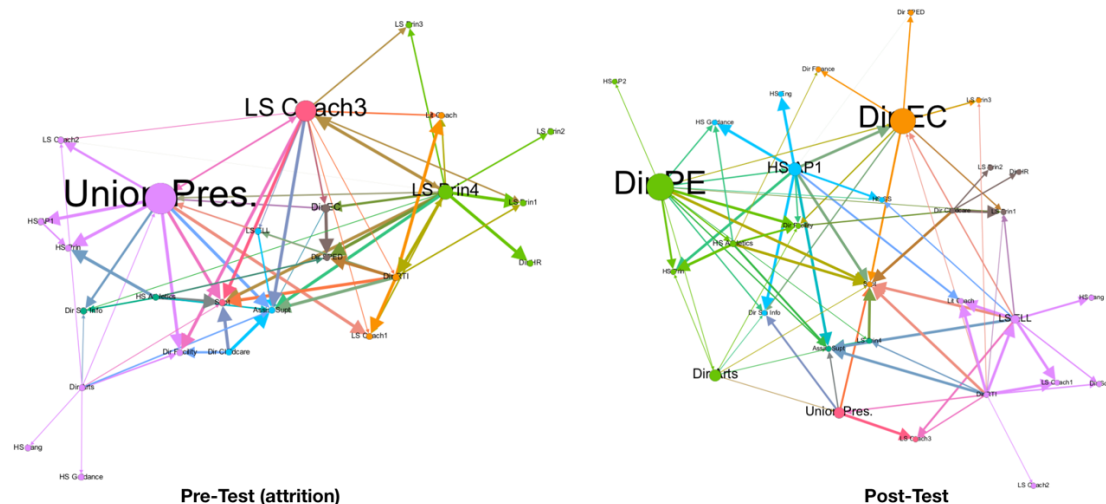
**Communication Dynamics in Bayview.** As mentioned in the process evaluation, participants in Bayview demonstrated the least amount of responsiveness to the intervention. Analysis of the digital resources did not reveal that any of the participants had engaged in the sociocultural activities of joint work, boundary spanning, and brokering (Honig, 2008; 2012; Honig & Rainey, 2014; Swinnerton, 2007). However, the Director of RTI and Elementary ESL Coordinator both used the resources in a different format — either on paper or as a separate digital tool — to engage in joint work with other groups of colleagues. For example, the Director of RTI provided the following details about her use of the Polarity Map for both joint work and boundary spanning in an email message.

I planned to use the Polarity Map at my School Psychologist meeting. It was eye-opening to me because they couldn't even get to the "Greater Good"! We were discussing an initiative we have been building to for several years now and I'm gearing up for really getting it going in the near future... When I asked them to state what they thought the greater good was - they were not able to articulate anything because they really don't understand it. This was SO helpful because now I see that I have to spend more time building the understanding about what it is and why it is thought to be better than what we are doing now... I will definitely use the Polarity Map with this group once we can start to get a better understanding (personal communication, December 8, 2017).

When examining Bayview's sociograms, the researcher assumed that the Director of RTI might appear central to the network given her proactive use of the resources, willingness to speak up in the check-in meetings, and position as a former principal. The pre-test sociogram (Figure 19) revealed a different network structure than anticipated. Towards the bottom of the network, the Director of RTI appears almost indiscernibly.



detected seven communities in the pre-test (attrition) sample that encompassed 8-32% of participants. Since the Superintendent and Assistant Superintendent did not complete the post-test, they are represented on both sociograms as small nodes with high in-degrees.



In the pre-test (attrition) network, the sociogram represents three individuals as larger nodes because of their high betweenness centrality: one of the lower school principals, a lower school coach, and the Union President. During the check-in meetings, the lower-school principal played an active role in the discussion. The lower school coach neither attended the check-in meetings nor made a single entry in the digital resources; however, he had a reputation within the state for his innovation with technology.

during the check-in meetings, comments in the *Essential Improvements* resource, and the conversation around her temporary dismissal from the admin council imply that she lost her position within in the network.

With the post-test sample, the modularity class algorithm detected communities that represent two separate high school alliances. One community, with the Director of Physical Education (PE) as the primary node, included 19.35% of the sample. A second community, led by one of the high school assistant principals, encapsulated 16.13% of the sample. Both the Director of PE and high school assistant principal indicated that they sought advice from others in the central office and high school but with varying levels of influence. Moreover, the high school Assistant principal indicated a *Very Influential* connection with the Director of Early Childhood that was not reciprocated. The Director of Early Childhood then formed a community with two other central office administrators and two lower school principals to account for 16.13% of the sample. With the exception of her connection to the Superintendent, her network does not appear to be very influential as indicated by the thinness of the edge weights.

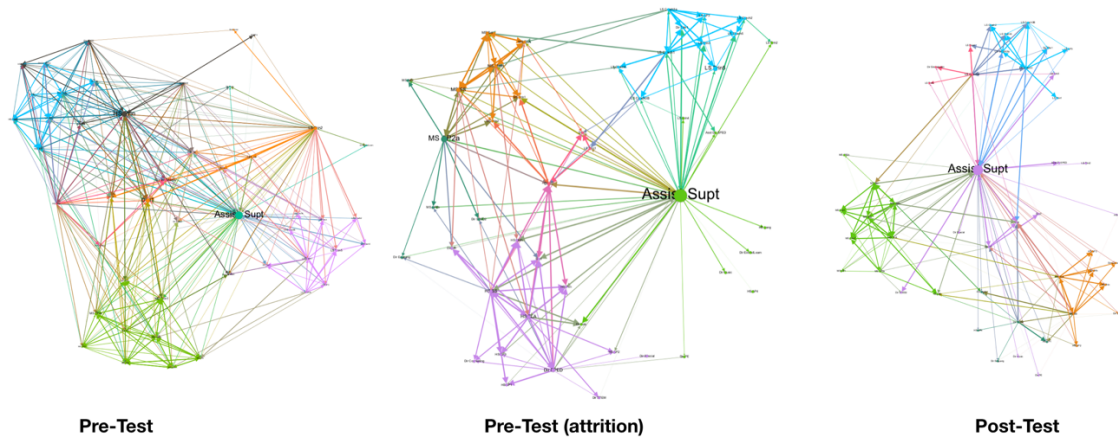
Finally, the Elementary ELL Coordinator emerged as a central node in the largest community (22.58%) of the post-test network. Like the other communities in the post-test sample, hers can be attributed to a high out-degree. With the exception of the Director of RTI, all of her edges are directed at others. Qualitative data infers that these communication channels could be to gather input in support of her new ELL initiatives. During an interview, she described some of her frustration with her position. She explained that she lacked authority with the teachers and did not receive enough active support from the Assistant Superintendent beyond words of encouragement. Her

comment could also help to explain the decrease in position of the Assistant Superintendent as he had fewer in-degrees in the post-test environment.

Within Bayview, communication seemed to be more in the form of access to information, controlling the agenda, and positioning specific messages. Both the interactions during the check-in meetings — such as the high school assistant principal's condescending remarks to the Elementary ELL Coordinator — and the sociograms seemed to confirm the presence of power dynamics versus organizational learning communities in Bayview. In political struggles, competing groups leverage power to serve their own interests (Bolman & Deal, 2008). This power could be in the form of authority, coercion, or control over scarce resources, but it could also be associated with access and control of the organizational agenda or the framing of meaning and messages (Bolman & Deal, 2008). When examining the sociograms and the qualitative data, the researcher inferred that the modularity class communities (Blondel et al., 2008) represented coalitions and factions rather than micro-communities as found in Hilltop.

**Communication Dynamics in Hilltop.** Unlike the first two districts, analysis of Hilltop's network revealed fewer and more tightly connected communities (see Figure 21). The pre-test sample detected eight communities with 4.26-21.28% of the sample within each one. When the researcher examined the modularity class communities in the pre-test (attrition) sample, only six communities could be detected, and the network communities more tightly aligned to the divisions: high school = 27.66%, middle school = 12.77%, and elementary school = 21.28%. Additionally, 21.28% of the network connections in the pre-test (attrition) sample can be associated with a community created

by direct outreach from the Assistant Superintendent. Her high out-degree (44 connections) and betweenness centrality (299.95) confirm this observation.



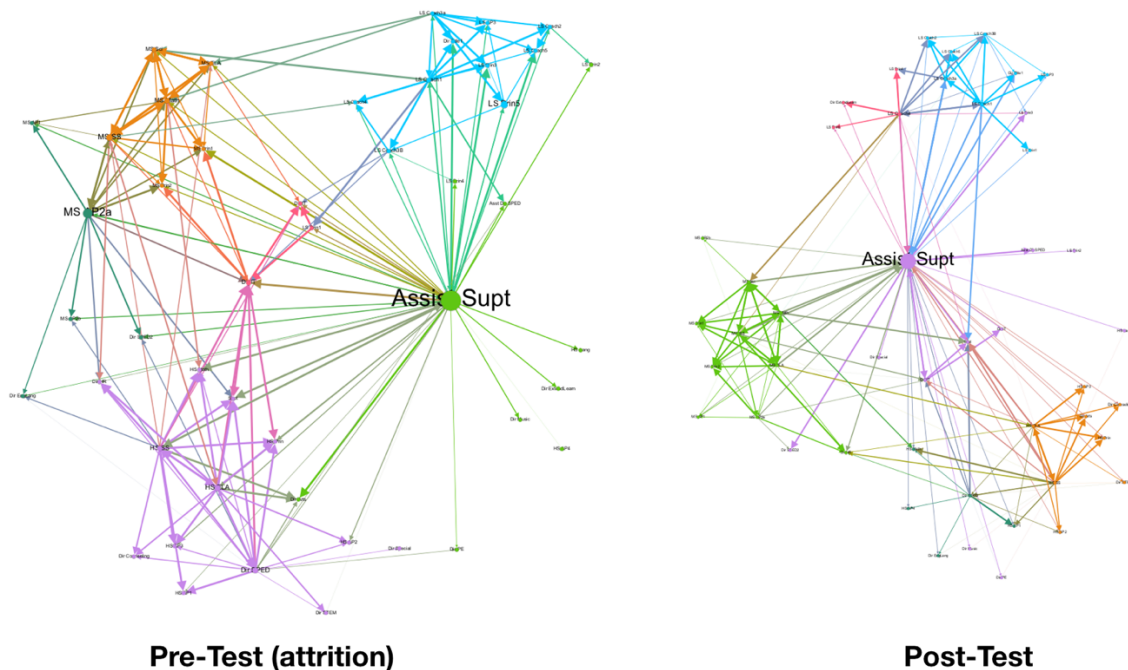
*Figure 21.* Hilltop sociograms. Comparison of the pre-test, pre-test (attrition), and post-test social networks. The colors indicate the presence of distinct communities aligned to each of the divisions.

The modularity class algorithm (Blondel et al., 2008) also revealed the presence of six communities in the post-test sample but with different percentages. The middle school now accounted for 21.28% of the network as compared to 17.02% in the elementary and high school divisions. Additionally, 25.53% of the sample could now be associated with the community surrounding the Assistant Superintendent - over a 4% increase in percentage. The network statistics further support this observation and revealed that her average degree rose from 49-59. Most notably, her in-degree increased from five to twelve, and her node moved towards the center of the network, indicating that she had gained influence within the district during the course of the intervention.

When comparing the pre-test (attrition) and post-test sociograms, two additional observations can be made (see Figure 22). First, fewer connections linked the three divisions in the post-test environment with one exception. An elementary school



coordinator developed a *Very Influential* connection with the middle school science coordinator — represented as a green/brown arrow stretching from a pink to a green node on the post-test sociogram. She also created new connections with two of the elementary school principals. Because this change in the sociograms coincided with the elementary coordinators' work on the new science curriculum, these actions could be interpreted as boundary-spanning — carrying information between nodes in the system (Swinerton, 2007).



*Figure 22.* Hilltop pre-test (attrition) and post-test sociograms. Comparison reveals further segregation by division, a shift in centrality by the Assistant Superintendent, and a continued move by the principals to the periphery of the network.

Second, much like with Bridgespan, the majority of principals exist on the periphery of the network and possess less influential in-degree connections as indicated by the edge weights. This implies that other participants did not seek out their advice, or find it as influential, and they did not engage in the sociocultural activities. Only two principals participated in the training session and completed the *Essential Improvements*

resource activity. In response to the prompt, *how might we make a change in environment, behavior, and/or belief to improve student learning*, the High School Principal wrote, “Transparent communication with all stakeholders and engaging all members of the community, seek feedback and work to implement change” (personal communication, August 23, 2017). Though the pre-test data shows that the High School Principal held a central location in the network and a high betweenness centrality, he moves to the periphery of the pre-test (attrition) and post-test networks because he did not complete the post-test. His actions appear to contradict his expressed beliefs from the *Essential Improvements* resource.

One of the elementary principals not only completed the activity but also put the ideas into action. She agreed to an interview with the researcher to discuss how she used the *Think-Feel-Care* routine as a strategy to encourage empathy with her teachers. Using the prompts from the *Think-Feel-Care* resource, she organized an afternoon professional development session to encourage a more meaningful multicultural conversation with her faculty. Similarly, the elementary coordinators described using the prompts from the *Think-Feel-Care* resource as a protocol to better empathize with colleagues and understand their reaction to upcoming changes in the science curriculum.

In both of these instances, the participants used the resources to engage in joint work — efforts that all parties find mutually beneficial (Honig, 2008;2012; Honig & Rainey, 2014) and that occur when individuals trust each other (Daly & Finnigan, 2010). Though the participants did not type into the digital resource, they used the prompts to have more effective conversations about the changes that they hoped to implement. Through their use of the *Think-Feel-Care* resource, both the principal and the elementary

coordinators also engaged in boundary-spanning — carrying information between the nodes in the system and engaging in bi-directional communication (Swinerton, 2007) — as they used the resources to interact with teachers who inhabited a different hierarchical layer in the district.

Though the modularity class percentages (Blondel et al., 2008) and associated sociograms illustrate the presence of smaller, tightly connected communities within the social network, qualitative observation, interviews, and conversations during the check-in meetings revealed that different dynamics occurred within those groups. As mentioned, the middle and elementary school coordinators collaborated on a regular basis. Though they did not always use the resources in their digital format, they adopted some of the prompts as protocols to improve communication within their micro-communities.

*Reflective, empathy, and communication-transparency* emerged as qualitative codes when analyzing transcripts from the check-in meetings with those two groups. The coordinators showed a willingness to talk through challenges using the resources and reflect on their own practice.

Whereas the edges connecting the middle and elementary school coordinators to each other indicated that they mostly found the advice of their colleagues *Very Influential*, the same could not be said of the high school coordinators. Not only did their connections appear less influential, but they also did not seem as closely connected. For example, the high school social studies and English coordinators indicated influential connections to each other but not math or STEM. This contrasts with the four subject-area coordinators from the middle school who communicated and collaborated as a group on a daily basis. Moreover, though the new Assistant Principal in the high school did not

respond to any of the social network questions, he rated his satisfaction with the quality of the network as *Not At All Satisfied*.

A second dichotomy emerged in the qualitative coding. In contrast to the elementary and middle school groups, the high school coordinators' interactions were coded as *political* on 22 occasions. Beginning with the comment from the Assistant Superintendent about the high school group being the most resistant to change and outside influence, the researcher noted instances of political power (Bolman & Deal, 2008) throughout the intervention. The high school group seemed more concerned about their control of information, their authority within the district, and the framing of their position (Bolman & Deal, 2008) than learning about the digital resources or using the concepts in practice.

In a phone call, the Assistant Superintendent lamented that the high school group views all changes as "either/or... they see items as a zero-sum game" (personal communication, October 27, 2017). From this perspective, any change implies the need for sacrifice (Boyd, Crowson, & Geel, 1994). When pressed for a deeper understanding of what they felt inhibited their use of the digital resources for collaboration, the high school coordinators consistently referenced their concerns about "privacy" and lack of time. From a zero-sum perspective (Boyd et al., 1994), participating in the intervention, communicating with others, and working towards a common language to describe innovation represented a possible gain, but it would come at the expense of time, autonomy, and transparency. Though the intervention intended to build community, these political dynamics appeared to deter the process.

**Communication Across Districts.** The social network analysis generated by the data from the SSSNQ (Pitts & Spillane, 2009) measured the change in quantity and quality of communication between the pre and post-tests. While this information generated the sociograms to illustrate the density, centrality, and influence of connections, the qualitative data embedded in the process evaluation helped to explain those structures. In looking across the three districts, three findings emerged.

First, traditional structures based on authority appeared to still control much of the communication. Particularly when examining the pre-test sociograms from Bridgetown and Bayview, the Superintendent, Assistant Superintendent, and other central office administrators emerged as nodes with high in-degrees and betweenness centralities. Second, across all three districts, the principals — who are typically considered instructional leaders within buildings (Goddard et al., 2015) — appeared on the periphery of networks. Instead, as suggested by Spillane et al. (2012), other individuals such as the coordinators and coaches emerged as central figures. Finally, the qualitative data captured by the process evaluation proved to be invaluable for interpreting the results of the sociograms. The transcripts, outputs from the digital resources, and observations not only triangulated with the data but also offered explanations of the illustrated dynamics. For example, without the process evaluation, it could have been assumed that each division within Hilltop possessed similar characteristics. However, the qualitative data revealed that the high school could be characterized as a coalition rather than a community.

As will be discussed, the social network data may have painted a more realistic picture of the participants in the districts than the survey data captured by the needs

assessment. Though results from the PLCA-R (Olivier et al., 2009) and OLS (Goh & Richards, 1997) implied the presence of learning communities within the districts, the social network analysis revealed a different reality. The social network data, as well as the detailed process evaluation, helped to explain the dynamics of the districts and, consequently, the results of the outcome evaluation.

## **Discussion**

This last section of the chapter presents a summary of the findings from across the cases. Then, it describes the role of power in deterring responsiveness to the intervention and affecting the communication between participants. Finally, the researcher discusses possible opportunities for future research as well as limitations to the intervention study.

### **Summary of Findings**

The three districts who participated in the intervention had similar demographics, and yet they possessed distinctly different characteristics that impacted the implementation. To accommodate the districts' schedules, union requirements, and internal power dynamics, the researcher modified the initial training session, schedule of face-to-face check-in meetings, and even the design of the digital resources to encourage participation. Though these changes impacted the intervention fidelity — the extent to which the core components of the intervention adhered to the original design (Nelson et al., 2012), adapting the program to the realities of the context in each district afforded an opportunity to focus on replication while accounting for variability (LeMahieu et al., 2015). The rich descriptions from the multi-site case study then allowed the researcher to examine cause and effect relationships within each district (Martinson & O'Brien, 2010).

Organizational learning (Senge, 1990; 2006) served as the theoretical framework for the design of the intervention. Consequently, the program intended for participants to engage in the three activities of organizational learning communities: theory-building, practice, and capacity-building (Senge & Kim, 2013). Within the intervention, theory-building addressed the development of common language to define and describe innovation of classroom practice to prepare students with future skills for the knowledge economy. Using the digital resources to engage in the sociocultural activities of joint work, boundary-spanning, and brokering (Honig, 2008; 2012; Honig & Rainey, 2014; Swinnerton, 2007) represented the desired practice. Capacity-building then referred to the improved quantity and quality of communication as well as the potential for organizational learning that would result from the act of engaging in theory-building and practice. The outcome evaluation used quantitative and qualitative measures to determine whether any change in these activities occurred as a result of the intervention.

**Capacity for Organizational Learning.** The Organizational Learning Survey (OLS) from Goh and Richards (1997) measured changes in organizational learning capacity through pre and post-tests. As expected, based on the low rates of frequency and responsiveness detected by the process evaluation, the quantitative survey data did not reveal any significant changes across the districts. However, the researcher discovered that the mean scores from all three districts surpassed those projected by the study validating the instrument (Goh & Richards, 1997). These findings on the OLS mirrored the relatively high scores detected by the Professional Learning Communities Assessment – Revised (PLCA-R) scale (Olivier et al., 2009) during the needs assessment. When

considered together, they indicated that the districts perceived the presence of learning communities.

In a case study of a Charter Management Organization, Moolenaar et al. (2014) found a correlation between the seniority of school leaders and their perceptions of a more innovative culture. The demographic data collected during the pre and post-tests indicated that the majority of participants from all three sites had held a position in their district for more than six years. This overestimation of the presence of the tenets of community structures could be attributed to participants' tenure within their district. However, both the qualitative data and social network analysis contradicted that perception.

**Development of Common Language.** Based on analysis of the literature in chapter one and the needs assessment in chapter two, the researcher attributed the inability to implement systemic innovation to a lack of shared language to define innovation of classroom practice. Though qualitative statements asking participants to define innovation were collected via the pre and post-test surveys, the researcher chose to examine the qualitative data across the cases instead due to a low response rate and participant attrition. Much like with the analysis of statements from the needs assessment, the researcher found that participants often used symbolic language that created an appearance of innovation (Bolman & Deal, 2008) but without defining the desired change or describing how it might be implemented.

For example, by embracing the *Future Ready* initiative in Bridgetown or discussing The Innovator's Mindset in Bayview, participants employed terms with figurative meaning such as *personalized learning* and engaged in activities that created



the appearance of legitimate effort such as the book-talk. From a symbolic perspective, the words carry importance and create a perception of a reality that may not exist (Bolman & Deal, 2008). By using language associated with concepts like *21<sup>st</sup> Century Skills* or Dr. Ruben Puentedura's SAMR model, participants also projected the appearance of being innovative. However, with the exception of the Assistant Superintendent as well as the lower and middle school coordinators in Hilltop, participants never engaged in deeper discussions about the instructional shifts that might lead to innovation: student learning, authentic problem-solving, student agency, or how technology infusion might support those goals (McLeod & Shareski, 2018).

**Communication and Social Networks.** Without communication between the layers in the organization, districts cannot develop common language or engage in organizational learning (Daly & Finnigan, 2010). The digital resources developed for this intervention intended to improve communication throughout the districts by encouraging the sociocultural activities of joint work, boundary-spanning, and brokering (Honig, 2008; 2012; Honig & Rainey, 2014; Swinnerton, 2007). To quantitatively assess whether these activities occurred, the researcher used Pitts and Spillane's (2009) School Staff Social Network Questionnaire (SSSNQ) to measure the quantity, direction, and quality of advice seeking networks. Though the sociograms generated from this social network data showed distinctly different communication patterns within each of the districts, some commonalities emerged.

First, the pre-test sociograms indicated that communication remained centralized within individuals who possessed positions of authority. The Superintendents and Assistant Superintendents, a few principals, plus district leaders such as the Director of

Educational Technology, emerged as central nodes with high in-degrees. This revelation implied that participants in the district continued to seek advice from formal leaders, perpetuating a hierarchical structure.

Next, the majority of the building principals were represented as nodes on the periphery of the networks. Spillane et al. (2012) discovered a similar pattern in their two-year study of 30 elementary schools. Contrary to their literature review which indicated that principals often assume the role of instructional leader, their social network analysis revealed that other informal leaders might have a greater impact on instructional change (Spillane et al., 2012). Similarly, the sociograms from both Hilltop and Bridgetown illustrated that the coordinators and coaches often bypassed the principal when seeking advice, either connecting with their colleagues or with central office administrators.

**Using the Digital Resources as Protocols.** Though the process evaluation indicated little use of the digital resources happened as intended, qualitative observations revealed that some participants used the components of the resources either in a different format or as a verbal protocol to engage in the sociocultural activities. For example, both the Director of RTI and Elementary ELL Coordinator in Bayview used the *Polarity Map* to engage in joint work with colleagues (Honig, 2012; Honig & Rainey, 2014). In a different instance, the elementary coordinators and one of the elementary principals engaged in joint work and boundary-spanning while using the *Think-Feel-Care* resource as a protocol. While participants in Bridgetown rarely collaborated using the digital resources, responses to the prompts within the *Essential Improvements* tool revealed that the DLT coaches started to connect with their principals as well as each other. This final revelation not only indicated the presence of joint work (Honig, 2012; Honig & Rainey,

2014), but also boundary-spanning — the process of communicating across the layers of the hierarchy (Swinerton, 2007). As mentioned, the Director of Educational Technology in Bridgetown also engaged in boundary-spanning as he navigated between the district office, principals, and DLT coaches.

Diffusion of any new policy, reform, or idea through the ecosystem of an organization requires strong social ties to facilitate communication (McLendon et al., 2015; Rogers, 2004a). The digital resources intended to provide districts with tools to strengthen existing communication networks. Unfortunately, as described in the next section, institutionalized power dynamics resulting from a tradition of hierarchical bureaucracy (Meyer, 2006; Weeres & Kerchner, 1995) often discouraged or prevented their use.

### **The Role of Power in the Intervention**

Communication, collaboration, and transparency threaten the entrenched hierarchies within districts and their associated structural power dynamics (Bolman & Deal, 2008). Much of the resistance observed during this intervention can be attributed to individual actors — such as the principals in Bridgetown, the Superintendent in Bayview, and the high school coordinators in Hilltop — attempting to maintain power based on existing structures. According to Crozier and Friedberg (1980), using the digital resources and actively engaging in the sociocultural activities could create a “zone of uncertainty” (p. 34). Retaining information increases control and subsequently an individual’s sense of power. When collaboration and transparency extend across the hierarchical layers of an organization, it threatens the structural power that an individual would otherwise retain based on their position (Bolman & Deal, 2008).

Because the digital resources encouraged communication and transparency, they threatened the entrenched power structures and consequently the ability to maintain control and authority. Additionally, when subordinates did not trust those in positions of authority or members of other coalitions, they resisted communication and transparency as it placed them in a position of vulnerability. Since political power can manifest when coalitions endeavor to control an agenda or frame an organization's message (Bolman & Deal, 2008), some of the most responsive participants used the digital resources as protocols. These individuals feared misinterpretation of their thinking from those who may not agree with them had they shared their work within the online environment.

Though the scores on the Organizational Learning Survey (Goh & Richards, 1997) intimated that the districts perceived themselves to be learning communities, the centralized communication structures revealed by the pre-test data from the social network analysis illustrated the presence of centralized control. Further, the qualitative data implied that the districts still experienced structural control and authority (Bolman & Deal, 2008). For instance, in Bridgetown, the admin council and DLT coaches used separate sets of resources since neither desired for the other to have access to their thinking. Likewise, in Hilltop, participants indicated that they required guidance and direction from the Superintendent before planning new initiatives.

Across all three districts, the researcher also coded interactions as demonstrations of political power (Bolman & Deal, 2008). Relationships and communication that impact the flow of information serve as sources of power (Crozier & Friedberg, 1980). Since the digital resources intended to foster communication through the sociocultural activities and increase transparency by encouraging participants to share their thinking in a

collaborative, online space, those currently in positions of authority may have resisted participating in the intervention to maintain control (Jaeger et al., 2014). This became salient in Hilltop. Neither the Assistant Superintendent nor the middle school coordinators felt comfortable sharing their thinking in the digital resources. As the Assistant Superintendent commented during an interview, sharing her thinking could exacerbate existing political tensions. She worried that her thoughts could be perceived as personal slights by some of the other principals — particularly the one who had also wanted her position. The middle school coordinators did not feel comfortable with anyone outside of their micro-community accessing their work. In particular, the Social Studies Coordinator expressed concerns that the teachers and principals might misinterpret their thinking.

Throughout the process evaluation, the researcher coded instances of political power across all three districts. As mentioned, it manifested as coalitions and alliances in Bayview, as well as the high school in Hilltop, and could be detected by triangulating the sociograms and the qualitative data. The researcher worried that an element of bias could have influenced her analysis of political power. Therefore, she triangulated the instances that she coded with the literature from Bolman and Deal (2008) and the quantitative data; maintained detailed reflections in her reflective journal per the recommendations and created an audit trail to establish credibility of analysis (Nastasi & Schensul, 1995; Tracy, 2010).

These manifestations of power contradicted the rationale for why the researcher purposively chose these three districts to participate in the intervention. Publicly, each one presented an appearance of being innovative. Central office leaders in Bridgetown

had a national reputation for their *Future Ready* efforts. The Bayview district had received national recognition for their innovation with technology, and Hilltop was featured in a MOOC for its visionary leadership. Unfortunately, the qualitative data revealed that much of this recognition could be attributed to the use of symbolic language that gave the appearance of legitimate innovation (Bolman & Deal, 2008) rather than actual reform.

If schools and districts hope to systemically innovate instructional practice to prepare students for the knowledge economy, then leaders need to model the traits of critical thinking, complex problem-solving, and creativity that they hope to see in their students (Gialamas, Pelonis, & Medeiros, 2014). Beyond the use of symbolic language and “organizational theater” (Bolman & Deal, 2008, p. 299) that gives the appearance of action, leaders need to create a school culture that promotes change and requires communication to create a new vision of learning (Gialamas et al., 2014). Meyer (2006) describes schools as existing in a state of *institutional isomorphism*, resistant to the changes created by the knowledge economy. On the contrary, Gialamas et al. (2014) argue for *morphosis* — a fundamental change in which leaders model the learning environment that they endeavor to create.

Oftentimes district leadership interpret new policies in ways that reinforce existing norms and power dynamics (Honig, Venkateswaran, McNeil, & Twitchel, 2014). For true reform to occur, district leaders need to engage in reflection and adopt as well as demonstrate the types of leadership behaviors that they hope to see in their subordinates. Without this fundamental change in leadership, reforms result in mere surface-level adoption (Honig et al., 2014) such as with the *Future Ready* initiative in Bridgetown.

Across all three sites, central office leadership perpetuated existing hierarchical structures rather than embrace the distributed communication and collaboration of organizational learning communities (Senge, 1990; 2006). For example, the Bayview Superintendent telling participants that the intervention should be considered secondary to their other responsibilities discredited both the intervention as well as the need to increase communication. When Bridgetown requested separate resources for the admin council and DLT coaches, the central office reinforced the existing hierarchical structures. Finally, both the lack of responsiveness from the Hilltop Superintendent and the sentiment from others in the district that they required his strategic direction serve as indicators of this phenomenon. Although the sociocultural activities intended to scaffold what Gialamas et al. (2014) referred to as *morphosis* by encouraging joint work, boundary-spanning, and brokering (Honig, 2008; 2012; Honig & Rainey, 2014; Swinnerton, 2007) to improve communication, only a small proportion of the sample actively participated in the intervention. The underlying power dynamics in the districts appeared to have prevented these actions from spreading beyond small micro-communities such as those found within Hilltop and Bridgespan.

### **Opportunities for Future Research**

**Organizational Learning Communities as Theoretical Framework.** Treatment theory describes the relationship between the inputs, activities, and outcomes of an intervention program (Leviton & Lipsey, 2007). According to the treatment theory for this intervention, use of the digital resources intended to encourage the sociocultural activities of joint work, boundary-spanning, and brokering (Honig, 2008; 2012; Honig & Rainey, 2014; Swinnerton, 2007). Consequently, the districts would improve their

communication, develop shared language to describe innovation of classroom practice to prepare students for the knowledge economy, and increase their capacity for organizational learning. Though the outcome evaluation did not reveal a significant change in communication, language, or capacity for organizational learning, the researcher attributes this to the design of the intervention rather than the theory of treatment.

Qualitative data revealed that participants required additional modeling and support to use the digital resources. Though the digital resources contained videos and descriptions to provide just-in-time training per recommendations from the professional development literature (Dede et al., 2008; Koehler & Mishra, 2005; Richardson et al., 2013; Rienties et al., 2013), participants indicated that they needed additional modeling and support to make effective use of the tools. In all three districts, the researcher had occasional opportunities to model the use of the digital resources with participants. After working with the *Polarity Map* during one check-in meeting, the Hilltop middle school coordinators commented that they could not have completed the thinking required by that digital resource without the researcher's assistance as well as the presence of an objective facilitator. The Elementary ELL Coordinator in Bayview expressed similar sentiments after working with the researcher on a separate occasion.

According to Cooksy et al. (2001), logic models provide the context through which to interpret data across multiple sites. These models indicate how outcomes connect to the intended theory by defining the inputs, activities, and outputs associated with the program (Cooksy et al., 2001). The process evaluation measured the fidelity of implementation in accordance with the logic model presented in chapter four. Though



the logic of the intervention did not produce the outcomes as intended, the theory of treatment built on the framework of organizational learning (Senge, 1990;2006) could support future designs that include more in-person instruction and coaching.

**Social Network Analysis as Needs Assessment.** The needs assessment described in chapter two used traditional measures of surveys and document analysis. However, because the surveys relied on self-reports, they may not have provided an accurate depiction of the problem of practice in context. As discussed, results from the Professional Learning Community Assessment - Revised (PLCA-R) (Olivier et al., 2009) and ENTRELEAD instruments (Renko et al., 2013) indicated that the districts perceived the presence of learning communities and entrepreneurial leadership. The social network analysis and qualitative process evaluation conducted during the intervention contradicted this finding. Therefore, future studies should include social network analysis as a component of the needs assessment to identify communication structures in advance of reform initiatives. Honig et al. (2014) would support this claim. They found that surveys and interviews often reveal perception rather than reality (Honig et al., 2014).

Additionally, social network theory explores the flow of communication throughout the social systems of large organizations (Daly et al., 2014). The sociograms generated from the data illustrate “patterns of relationships... [that] may present dynamic tensions as these patterns can act as both opportunities and constraints for individual and collective action” (Daly et al., 2014, p. 15). By understanding the flow of communication through the district before beginning an intervention, researchers could

anticipate the social structures that might support the diffusion of new ideas (Rogers, 2004a) and also determine the presence of community structures.

**Design-Based Research.** Systemic change requires both the testing of ideas as well as ongoing learning through rapid cycles of inquiry (Perla et al., 2013). Though the researcher used a multisite case study as a variant on an embedded mixed methods design (Creswell & Plano Clark, 2011) to measure the effects of this intervention, future studies might consider design-based research strategies as an alternative. Design experiments focus on creating a specific form of learning environment and studying it in context to gain a better sense of the learning ecology (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003). Further, design-based research takes into account the variability of educational environments, derives findings from formative assessment, studies learning in context, and accounts for the complexities of the real world in practice (Collins, Joseph, & Bielaczyc, 2004). Using both quantitative and qualitative methods, design-based researchers observe components of a design in context (Collins et al., 2004).

Additionally, design-based research encourages collaboration with participants and facilitates ongoing improvement (Penuel, Fishman, Haugan Cheng, & Sabelli, 2011). During the intervention, the researcher modified the digital resources as well as the program to meet the needs of the participants and encourage participation. However, the participants did not feel as though they had ownership of the intervention. Instead, it was an external reform introduced by the researcher. One of the elementary school principals in Hilltop commented in an interview that the resources might have been used more frequently if the participants had contributed to their design.

Therefore, by engaging the participants in cycles of improvement such as the Plan-Do-Study-Act cycles promoted by improvement science (Cohen-Vogel et al., 2015), the digital resources and other intervention components could be developed iteratively and collaboratively with participants; prototyped and tested under varying conditions; and then refined to match the unique context and cultures of the districts. Further, by engaging participants in the design of the intervention, they would increase their capacity to communicate the intent of the program throughout the social networks of the district (Rogers, 2004b). When innovations successfully diffuse within the ecosystem of an organization, change agents help to develop the need for change, translate intention into action, and encourage adoption through social learning and modeling (Rogers, 2004b). Because the participants in the researcher's intervention never had that opportunity, many did not feel as though they could adapt the digital resources to their specific context. If the ultimate goal is systemic innovation of classroom practice through the development of shared language and organizational learning, future studies should thus consider a more iterative, user-centered, design-based approach rather than the application of a single intervention (Bannan-Ritland, 2003).

**Learning through Observation and Adaptation.** Implementing learning environments built on tenets of deeper learning, student agency, authentic context, and technology infusion (McLeod & Shareski, 2018) directly conflicts with the organizational structure of traditional public school districts that predominantly value convergent thinking, standardized assessment, and measures of efficiency (Collins & Halverson, 2010). Given this dichotomy, exemplars rarely exist beyond pockets in individual

classrooms. Further educators and administrators struggle to envision these examples within existing organizational structures (Holland, 2018a).

According to social learning theory (Bandura, 1986), individuals learn not only through enactive experience but also through vicarious observation. From an organizational perspective, Fullan and Edwards (2017) assert that successful systems learn from others and then build a vision of change based on those lessons that then supports their own culture. However, these vicarious learning experiences need to be well-designed and include a skilled instructor who can help individuals to notice the important tenets that they should learn (Gee, 2015). Therefore, an intervention that includes leadership coaching to develop new mental models based on the tenets of successful systems such as the High Tech High network and Bellevue Public Schools might be a final area for future study.

High Tech High, a network of charter schools in the San Diego area, supports a diverse population of students and embodies what may be possible when a system adapts an existing idea and builds a culture around it (Holland, 2018b). Students in High Tech High schools learn in interdisciplinary teams, complete real-world projects, and share their learning through public demonstrations (Wagner & Dintersmith, 2016) — all traits of successful systems as defined by the *Worldwide Educating for the Future Index* (Walton, 2017). Larry Rosenstock, the CEO, founded the network in 2000 based on the values of equity, authenticity, community, and inquiry established by Ted Sizer's *Coalition of Essential Schools* (Wagner & Dintersmith, 2016). Much like the systems described by Fullan and Edwards (2017), High Tech High has evolved as an organization that learned from the successes of others (Holland, 2018b).

High Tech High represents what may be possible when an organization does not possess a socio historical culture formed by the chronosystem of the American public education system (Holland, 2018b). Instead, it evolved in response to the macrosystem of the knowledge economy. Unfortunately, some leaders may reject High Tech High as a model because it deviates from many of the traditional tenets of school. In Hilltop, the Assistant Superintendent commented that she wanted the principals to understand what makes High Tech High *innovative* even if they could not replicate the model in their district. When examined through the theoretical framework of organizational learning communities (Senge, 1990; 2006), High Tech High represents what may be possible when an organization shares a common language of pedagogy (theory-building); regularly engages in joint work, boundary-spanning, and brokering (Honig, 2008; 2012; Honig & Rainey, 2014; Swinnerton, 2007); and possesses the capacity to learn and adapt (Senge & Kim, 2013). For that reason, it makes an excellent exemplar on which to base future conversations.

In a different vein, Bellevue Public Schools — a traditional, PreK-12 district just outside of Omaha, Nebraska — has spent the last five years focused on incremental whole-system change (Feldmann & Holland, 2016). Fullan and Edwards (2017) argue that whole system change involves all classes and all schools — not just exemplars. Further, whole system change focuses on pedagogy, not technology or isolated strategies and events. Finally, whole system change should result in measurable outcomes for *all* students (Fullan & Edwards, 2017). As such, when Bellevue launched their iPad Academy in 2013, they set the ambitious goal of achieving that whole-system change (Feldmann & Holland, 2016).

Beyond a desire to improve student access to technology, district leaders wanted to increase student learning and achievement while fostering a culture of creativity, curiosity, and individualized learning (Feldmann & Holland, 2016). The iPad Academy — an in-district, professional learning community — evolved from the belief that innovation of classroom practice requires an emphasis on professional development and the establishment of a student-centered classroom culture. Though the program focuses on creating educators prepared to embrace technology, the real transformation results from the development of pedagogical and content knowledge through on-going coaching and support (Feldmann & Holland, 2016).

In Bellevue, technology infusion serves as the catalyst for differentiation, personalization, and deeper learning (Holland, 2018b). Students gain a deep body of content knowledge, engage in inquiry and reflection, have opportunities to present their understanding in creative ways, and assume ownership of their learning (Holland, 2018b). To achieve this vision of student learning, the district has developed a language of pedagogy centered around Horn and Staker's (2014) concept of disruptive, blended learning (Feldmann & Holland, 2016). Through the structure of iPad Academy, district leaders have worked to diffuse that language incrementally throughout the district (Holland, 2018b).

Both High Tech High and Bellevue Public Schools serve as exemplars of what may be possible when a system supports systemic instructional innovation. Even though they have defined that innovation in different ways, both highlight what may be possible when an organization possesses a shared language of pedagogy as well as a system of communication to diffuse that language throughout the ecosystem. Therefore, designing

a new intervention around helping leaders to notice these effects and then collaborate on ways to adapt them to their context could be an opportunity for future study.

### **Limitations**

Though the mixed-methods embedded design proposed for this intervention permitted the use of multiple data sets to answer separate research questions and incorporated both qualitative as well as quantitative methodologies (Creswell & Clark, 2011), several limitations must be acknowledged. First, a number of factors limit the ability to determine causation. Even though the multi-site case study reduced some threats to validity, the lack of a treatment and control condition reduced the ability to make strong causal statements (Shadish et al., 2002). Additionally, since the researcher used purposeful sampling to select the cases, these sites may not be representative of the larger population which limits the transferability and generalizability of any claims (Martinson & O'Brien, 2010). Though the multi-site design somewhat mitigates this bias because the comparisons across districts mitigated plausible alternatives, random assignment would further rule out threats to validity (Shadish et al., 2002).

In addition to reducing threats to external validity, a quasi-experiment would have attenuated sampling bias, created a stronger counterfactual, and accounted for the influence of history and extraneous variance (Shadish et al., 2002). With experiments and quasi-experiments, researchers create a strong counterfactual such that they can accurately attribute changes to the intervention rather than external factors. Since case studies do not provide that evidence, it may be difficult to discern what might have occurred without the intervention. Further, random assignment reduces the plausibility of observed effects, as well as removes the experimenter expectancies that could be

associated with purposeful sampling, mitigating threats to internal validity (Shadish et al., 2002).

Beyond the potential for selection bias because of the sampling method, participant attrition, and the lack of a control group (Shadish et al., 2002), another major threat may be restriction of range. Shadish et al. (2002) describes this threat as either restricting the range of results examined or limiting the dosage of the treatment. Though the ideal dosage for this intervention included participation in the training and face-to-face meetings as well as regular tool-use, participants within and across districts received varying doses of the intervention. Inconsistent dosage certainly impacted the potential to determine the effects of the intervention and serves as another limitation to this study.

Finally, extraneous variance in organizational structure presented a significant risk as the complexity of working across districts introduced a number of confounding variables. In Bridgespan, the new DLT coaching structure might have affected communication with a similar magnitude and direction as the intervention. Similarly, in Hilltop, the presence of a new Assistant Superintendent as well as the process of creating a new strategic plan played a role in the communication patterns that evolved during the intervention. Though little structural change occurred within Bayview, tensions surrounding a district capacity project did manifest during face-to-face observations. The presence of these extraneous factors, and the reality that they could affect communication between stakeholders, were accounted for through the qualitative analysis (Shadish et al., 2002).



## **Conclusion**

To prepare students for a labor market and society that values non-routine cognitive tasks such as "working with new information" and "solving unstructured problems" (Levy & Murnane, 2013, p.18), teachers need to adopt classroom practices that foster their students' critical thinking, creativity, and problem-solving skills (Soulé & Warrick, 2015) within a system that supports instructional innovation (Martinez et al., 2016). The technology, globalization, and rapid rate of change that characterizes the knowledge economy should serve as a call-to-action for institutional change within American public schools (Weeres & Kerchner, 1995); however, a problem of practice exists: district administrators and school leaders lack a shared language to clearly communicate a vision for instructional innovation to prepare students with future skills such that the ideas diffuse throughout the social networks of the district's ecosystem (Rogers, 2004a). As a result of this communication failure, school and district leaders struggle to bring the education system into alignment to meet the disparate demands of the knowledge economy (Honig & Rainey, 2015).

Chapter one used Bronfenbrenner's (1979) Ecological Systems Theory (EST) as a framework through which to investigate the problem of practice. Examination of the literature delineated the impact of historical, social, economic, and cultural systems on the interactions between individuals within the networked micro and mesosystems (Neal & Neal, 2013) of American public school districts. Unfortunately, the industrial era organizational culture of districts emphasizes bureaucratic controls that impose limitations on teachers and interfere with the types of classroom practices that would be of benefit to students (Mitzberg, 1989). Adopting new practices that leverage twenty-first

century technologies and foster students' knowledge economy skills challenge the structures on which public schools and educators base their identities: curriculum sequencing, age-based grading, standardization, and efficiency (Collins & Halverson, 2010). Students can now learn anywhere, at any time, and from any other person (Collins & Halverson, 2010). Despite the influence of the knowledge economy and digital technologies, most American public school districts continue to operate as industrial era bureaucracies instead of networked, 21<sup>st</sup> century professions (Mehta, 2013a).

Initially, the researcher hypothesized that the problem of practice lay in the organizational structures of the districts themselves. Because schools and districts exist as social systems that operate based on a set of institutionalized cultural norms (Willower, 1991), the researcher assumed that traditional, bureaucratic structures prevented innovation. Chapter two thus described the mixed-methods, explanatory research study (Creswell & Plano Clark, 2011) conducted as a needs assessment. After analyzing the quantitative and qualitative data collected in four suburban districts in the Northeastern U.S, the researcher instead ascribed the problem of practice to a lack of communication and common language between the individual stakeholders in the districts rather than the existence of hierarchical, bureaucratic controls as data collected via the PLCA-R (Olivier et al., 2009) and ENTRELEAD (Renko et al., 2013) surveys indicated that the participants perceived both a sense of community as well as the presence of entrepreneurial, innovative leadership within their districts.

Using Senge's (1990; 2006) concept of Organizational Learning Communities as the theoretical framework, chapter three described the design of a set of digital resources to support the activities of organizational learning: theory-building, practice, and capacity

(Senge & Kim, 2013). Interacting with the digital resources intended to improve the quantity and quality of communication (practice), build shared language to describe innovation of classroom practice to prepare students for the knowledge economy (theory-building), and increase the districts' capacity for organizational learning (capacity-building).

Chapter four presented the details of the intervention program and discussed the use of a multi-site explanatory case study as a variant on a mixed-methods, embedded research design (Creswell & Plano Clark, 2011). In this intervention study, the secondary process evaluation assessed the fidelity of the program implementation and supported interpretation of the mostly quantitative outcome evaluation (Creswell & Plano Clark, 2011). Frequently used to analyze school-based innovations — such as the implementation of the digital resources designed for the intervention — the research design incorporated quantitative and qualitative data to examine both the outcomes as well as the process of implementation (Martinson & O'Brien, 2010). Additionally, the multi-site case study allowed the researcher to make comparisons both within and across the participating districts (Martinson & O'Brien, 2010) as well as to address the realities of implementing an innovation that accounts for the varied cultures that manifest in American public schools (LeMahieu et al., 2015).

Multi-site case studies describe events in context and do not intend to make causal claims (Martinson & O'Brien, 2010). Therefore, though the intervention findings in chapter five did not reveal any significant differences between the pre and post-tests, the qualitative process evaluation presented valuable rich descriptions. When used, the digital resources showed the potential to encourage the sociocultural activities that would

ultimately lead to the development of shared language and increased organizational capacity. As such, the researcher determined that while the logic of the intervention may not have been effective in the context of the three districts who participated in the study, organizational learning (Senge, 1990; 2006) as a theoretical framework may be applicable in future studies.

In a study of educational systems that demonstrated sustained, systemic improvement, Mourshed et al. (2010) described the intervention clusters that helped systems progress along a continuum from poor to excellent. As systems progress from poor to fair, they ensure that students achieve basic literacy and numeracy. When progressing from fair to good, they consolidate financial and organizational systems to increase accountability for student learning. Their analysis indicated that great systems function as learning communities who possess a shared language of pedagogy, and excellent systems then leverage that shared language as well as the support for peer networks to diffuse and implement innovation (Mourshed et al., 2010).

The researcher designed an intervention that would help a system move from great to excellent along this continuum. Based on the quantitative data from the PLCA-R (Olivier et al., 2009) and ENTRELEAD scales (Renko et al., 2013) captured during the needs assessment, it appeared as though the districts already possessed the learning communities to support the development of shared language. However, the social network analysis conducted during the pre and post-tests of the intervention revealed more traditional, centralized communication structures. While the digital resources might have supported a system moving from great to excellent along the continuum described

by Mourshed et al. (2010), the process evaluation revealed that the districts who participated in the intervention did not possess the requisite communication structures.

In 2016, Klaus Schwab — the executive chairman of The World Economic Forum — announced the arrival of the Fourth Industrial Revolution. He described this era as one destined to introduce increasing complexity into society at an exponential pace (Schwab, 2016). According to Schwab (2016), the First Industrial Revolution mechanized production through the use of steam and water. The second introduced electricity and mass production, hallmarks of the Industrial Era. Where the Third Industrial Revolution ushered in the information age and automated much of mass production, the Fourth Industrial Revolution will be represented as a fusion of digital, physical, and biological systems (Schwab, 2016). However, despite decades of attempts at education reform to prepare students for the knowledge economy (Fusarelli & Fusarelli, 2015; Mehta, 2013b), the American K-12 public school system has largely failed to keep pace with the ensuing intellectual and technological demands (Gordon, 2014).

The intervention described in this dissertation endeavored to make improvements in three, small suburban districts in the Northeast region of the U.S. Unfortunately, the power dynamics present within the normative social structures of the districts (Willower, 1991) prevented them from systemically adopting both the digital resources as well as the associated sociocultural practices. A history of bureaucracy, standardization, and efficiency formed the organizational cultures on which districts base their identities. Implementing this intervention program with fidelity required moving away from those structures institutionalized within the educational system since the Industrial Revolution

(Chubb & Moe, 1990). To counter the forces of history, Gialamas et al. (2014) advocate that leaders need to undergo *morphosis*, a fundamental transformation that would result in their modeling of the behaviors that they hope to see executed within their schools. These behaviors would include sincerity, transparency, and communication (Mourshed et al., 2010). Ultimately, to prepare students with the skills that they need for success in the knowledge economy, district leaders need to develop shared language to describe a vision for innovation of classroom practice such that it diffuses throughout the social systems of the district (Rogers, 2004a). Without this shared language, districts may more closely resemble the *Tower of Babel* (Genesis 11:9, The New King James Version) where individuals fail to understand each other's speech.

According to the book of Genesis, after *The Great Flood*, all of the people who inhabited the Earth spoke the same language. As such, they came together and decided to build a great tower to reach the heavens (Genesis 11:4). Somewhat similarly, after the Industrial Revolution, educators and administrators emerged sharing a language based on the principles of Scientific Management and the tenets of behaviorism (Lagemann, 1989; Tyack & Tobin, 1994). This shared language ultimately formed the institution of American public education. As told by the Bible, upon seeing the tower and all that the people had accomplished, the Lord "confound[ed] their language, that they may not understand one another's speech" (Genesis 11:7) and scattered humankind around the world.

Though biblical scholars may not view the introduction of computers into society as synonymous with the events that occurred in Babel, the intellectual, technological, and interpersonal demands of the knowledge economy (Levy & Murnane, 2013) have

essentially scattered educators and confounded their speech. As illustrated by the districts in this study, educators and administrators no longer share the same language to describe classroom practice in this new era. Given the complexity and variability across American public school districts (Bryk et al., 2015), it may not be reasonable to assume a shared national language; and yet, much like the ways in which the people of Babel scattered into new cities, the same needs to occur within districts. Whether referring to today's era as the 21<sup>st</sup> century, the knowledge economy, the information age, the innovation era, or the 4<sup>th</sup> Industrial Revolution, students need to possess not only traditional literacies and the capacity to leverage technology, but also the broader capacity to engage in empathy, analysis, synthesis, leadership, and iteration (World Economic Forum, 2015). To achieve this aim, teachers need to reimagine their classroom practice within a system that supports their instructional innovation (Martinez et al., 2016).

In 1916, John Dewey advocated that as new technologies add increasing complexity into society, the need for teaching and learning becomes even more critical. However, he also warned of a danger in creating an education experience that focused on learning for school rather than learning for life (Dewey, 1916). A century later, Klaus Schwab echoed these sentiments in response to the rapid advances of the Fourth Industrial Revolution, and called for a new vision of education and society:

In the end, it all comes down to people and values. We need to shape a future that works for all of us by putting people first and empowering them. In its most pessimistic, dehumanized form, the Fourth Industrial Revolution may indeed have the potential to “robotize” humanity and thus to deprive us of our heart and soul.

But as a complement to the best parts of human nature—creativity, empathy, stewardship—it can also lift humanity into a new collective and moral consciousness based on a shared sense of destiny. It is incumbent on us all to make sure the latter prevails (Schwab, 2016).



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## Appendix A

### Email Drafts

#### **Introductory Letter**

Hello Members of the \_\_\_\_ Public Schools Community.

I am a doctoral student in the Entrepreneurial Leadership in Education program at Johns Hopkins University and hope that you can help me with my research study. Your participation in this anonymous, online survey should take approximately 15 minutes and will be a tremendous benefit to my studies.

Please go to [tinyurl.com/brh-jhu16](https://tinyurl.com/brh-jhu16) to begin.

If you have any questions, you are welcome to contact me at [bholla10@jhu.edu](mailto:bholla10@jhu.edu) or by phone at 401-835-5753.

Thank you for your time.

Sincerely,  
Beth Holland

#### **Follow Up Letter**

Hello Members of the \_\_\_\_ Public Schools Community.

For those of you who have already completed the survey as part of my research study, thank you so much for your efforts. If you have not yet had the opportunity to complete the online questionnaire, I would greatly appreciate it if you could do so by the end of the day on Friday, November 4th as the data will inform my end-of-term papers. Your participation in this anonymous, online survey should take approximately 15 minutes and will be a tremendous help to my studies.

Please go to [tinyurl.com/brh-jhu16](https://tinyurl.com/brh-jhu16) to begin.

If you have any questions, you are welcome to contact me at [bholla10@jhu.edu](mailto:bholla10@jhu.edu) or by phone at 401-835-5753.

Thank you again for your time.

Sincerely,  
Beth Holland



## Appendix B

### Survey Instrument

#### Section 1 – General Information

1. Geographic Location of District: city/state (text box)
2. Name of District & Name of School
3. How would you describe your district? (choose from list)
  - Urban
  - Rural
  - Suburban
4. How many separate school buildings are there in your district? (choose from list)
  - 1-10 separate buildings
  - 11-20 separate buildings
  - 21-50 separate buildings
  - 51-100 separate buildings
  - 101+ separate buildings
5. What percentage of your students qualify for Free or Reduced Price Lunch? (choose from list)
  - Less than 10%
  - 11-30%
  - 31-50%
  - Greater than 51%
  - I don't know
6. What percentage of the students in your district are English Language Learners? (choose from list)
  - Less than 5%
  - 6-10%
  - 11-20%
  - 20% or higher
  - I don't know
7. What is your position within your school or district? (choose from list)
  - Superintendent
  - Assistant Superintendent
  - Technology Director/CTO
  - Director of Curriculum or Director of Innovation
  - Principal
  - Assistant Principal
  - Instructional or Technology Coach

#### Section 2 – Qualitative Question #1: What's needed to support innovation?

- 1a. What do you [central office leaders] believe that principals/assistant principals/coaches need to better support their teachers as they innovate their classroom practice with technology?
  - Why do you believe that providing those structures or systems may provide the necessary support?
- 1b. What do you [principals/assistant principals/coaches] feel that you need from the central office leadership to support your teachers' innovation of classroom practice with technology?
  - Why do you believe that providing those structures or systems may provide the necessary support?

### **Section 3 – Perceptions about Knowledge Economy Skills**

Questions based on the Curriculum & Assessment Gear of the Future Ready Framework

Indicate your level of agreement with the following statements:

**Scale:** Strongly agree, Agree, Neither agree or disagree, Disagree, Strongly agree

8. Our district has established Knowledge Economy Skills (i.e., problem solving in novel situations, communication and collaborating using the appropriate technology, analyzing and synthesizing information) as learning standards for all students across all levels.
9. Our district has clearly communicated to all stakeholders its expectations that schools will integrate 21st Century skills into the learning of all students.

Indicate the level of emphasis your district places on each of the following Knowledge Economy skills:

**Scale:** Strong emphasis, Moderate emphasis, Little emphasis, No emphasis

10. Critical thinking and problem solving in novel situations
11. Creativity and innovation
12. Collaboration with the appropriate technologies
13. Communication with the appropriate technology
14. Self-Direction
15. Visual Learning
16. Information Literacy
17. Global and Cultural Awareness

Indicate your level of agreement with the following statements:

**Scale:** Strongly agree, Agree, Neither agree or disagree, Disagree, Strongly agree

18. Our district has revised all curricula to foster students' Knowledge Economy skills
19. Our district has developed model lessons that demonstrate how Knowledge Economy skills should be integrated into each of the content areas.
20. Our district has provided educators with access to digital content and resources that are designed to support the development of students' Knowledge Economy skills.
21. Our district has systems in place that support educators in their integration of Knowledge Economy skills into the curriculum and into their instruction.
22. Teachers are provided time to work together to redesign lessons to integrate Knowledge Economy skills.
23. Our district has provided teachers with access to reliable, unbiased sources that accurately describe and rate digital resources for potential use in the classroom.
24. Teachers are provided the resources and support needed to redesign classrooms into innovative learning environments that incorporate the available technologies.
25. Our district is assessing students on their attainment of Knowledge Economy skills (i.e., problem solving in novel situations, communication and collaborating using the appropriate technology, analyzing and synthesizing information).
26. Our district reports students' attainment of Knowledge Economy skills separately from the students' achievement in the content areas.
27. The assessment of students' Knowledge Economy Skills is accomplished largely through teachers' use of performance assessments (e.g., rubrics and observations) within the classroom.
28. At this time the district does not assess students' Knowledge Economy skills.

**Qualitative Question #2:** Describe your vision for innovation with technology in a classroom setting.

#### **Section 4 – District as Learning Community**

ENTRELEAD Scale (Renko et al., 2015) to measure innovative/entrepreneurial orientation of organizational leadership.

Article states that a “7-point Likert Scale” is used with each question. Respondents should *consider their most immediate supervisor* and then address these questions.

29. Often comes up with radical improvement ideas for transforming classroom practice
30. Often comes up with ideas of completely new ways to improve student learning
31. Takes risks
32. Has creative solutions to problems
33. Demonstrates passion for his/her work
34. Has a vision of the future of our school or district

- 35. Challenges and pushes me to act in a more innovative way
- 36. Wants me to challenge our current practices

PLCA-R Scale (Oliver et al., 2010) to measure degree to which district functions as a learning community

**Scale:**

1 = Strongly Disagree (SD)

2 = Disagree (D)

3 = Agree (A)

4 = Strongly Agree (SA)

- 37. A collaborative process exists for developing a shared vision among staff.
- 38. Shared values support norms of behavior that guide decisions about teaching and learning.
- 39. Staff members work together to seek knowledge, skills and strategies and apply this new learning to their work.
- 40. Decisions are made in alignment with the school's values and vision.
- 41. A collaborative process exists for developing a shared vision among staff.
- 42. School goals focus on student learning beyond test scores and grades.
- 43. Policies and programs are aligned to the school's vision.
- 44. Stakeholders are actively involved in creating high expectations that serve to increase student achievement.
- 45. Data are used to prioritize actions to reach a shared vision.

## Appendix C

### Qualitative Code Books from the Needs Assessment

#### **ENTRELEAD and PLCA-R Codes**

When analyzing the survey items pertaining to the requisite structures to support teachers with innovation of their classroom practice, the researcher used the following codes based on the items from the ENTRELEAD (Renko et al., 2013) survey and the *Shared Values and Vision* sub-scale of the PLCA-R instrument (Olivier et al., 2009).

##### **From ENTRELEAD (Renko et al., 2013)**

- Radical improvement ideas for transforming classroom practice.
- Ideas of completely new ways to improve student learning.
- Takes risks.
- Creative solutions to problems.
- Demonstrates passion for his/her work.
- Vision of the future of our school or district.
- Challenges and pushes me to act in a more innovative way.
- Wants me to challenge our current practices.

##### **From PLCA-R (Olivier et al., 2009)**

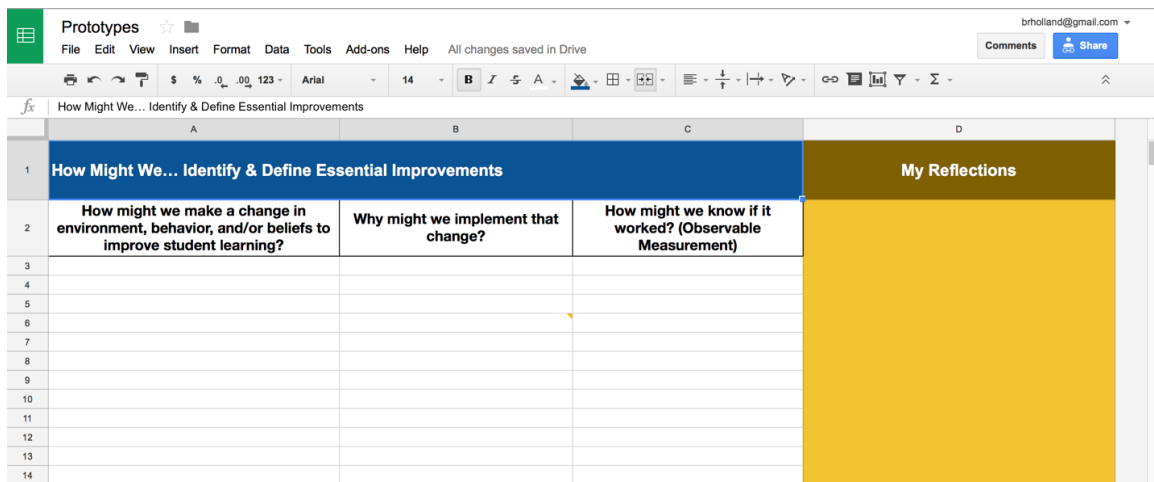
- Has a vision for the future/ Collaborative process exists for developing a shared vision among staff
- Shared values support norms of behavior that guide decisions about teaching and learning.
- Staff members work together to seek knowledge, skills and strategies and apply this new learning to their work.
- Decisions are made in alignment with the school's values and vision.
- A collaborative process exists for developing a shared vision among staff.
- School goals focus on student learning beyond test scores and grades.
- Policies and programs are aligned to the school's vision.
- Stakeholders are actively involved in creating high expectations that serve to increase student achievement.
- Data are used to prioritize actions to reach a shared vision.

## Appendix D

### Digital Resources

Because the districts participating in the intervention had already adopted the G Suite for Education platform (Google's free collaborative tools), the researcher designed the digital resources using Google Slides and Google Sheets. During the training session, the participants confirmed that they could access the resources via Google Drive and completed an introductory activity using the Resource Guide and Essential Improvements resource.

A demo version of the digital resources can be found at <http://bit.ly/demo-resources>. The Resources Guide explained the overall program, suggestions for getting started, the purpose for each individual resource, and instruction for how to use each resource. Participants could open the individual resources via a button on the corresponding page. The figures below illustrate the individual resources.



	A	B	C	D
1	How Might We... Identify & Define Essential Improvements			My Reflections
2	How might we make a change in environment, behavior, and/or beliefs to improve student learning?	Why might we implement that change?	How might we know if it worked? (Observable Measurement)	
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

*Figure D1.* Essential Improvements resource. Each individual had their own copy of this resource to work through the prompts. They could also view and comment on their colleagues' work.

Prototypes

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Comments Share

Step Inside the System: Think-Feel-Care

	A	B	C	D	E
1	Step Inside the System: Think-Feel-Care				My Reflections
2	Who (first name or job title)	Think - what do you understand about this person and their role within the system of school?	Feel - what is this person's emotional response to the system of school and to their position within it?	Care - what are this person's values, priorities, or motivations about teaching and/or learning? What is important to this person?	
3					
4					
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Figure D2. Think-Feel-Care resource. Each individual had their own copy of this resource to work through the prompts. They could also view and comment on their colleagues' work.

Prototypes

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Comments Share

My Reflections

	A	B	C
1	Step Inside the System: Empathy Map		
2	Who (first name or job title of the person you are talking to):		
3	Say - What does this person say during the conversation?	Think - What does this person seem to believe?	My Reflections
4			
5	Do - What do you observe the person doing?	Feel - How do you think that the person feels about the topic of conversation?	
6			

Figure D3. Empathy Map resource. Each individual had their own copy of this resource to work through the prompts. They could also view and comment on their colleagues' work.

Prototypes

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Comments Share

My Reflections

	A	B	C	D	E	F	G
1	<b>Finding Balance: Polarity Map</b>						
2	<b>12. Action Steps</b>		<b>1. Greater Purpose:</b>			<b>10. Action Steps</b>	
3			<b>5. Notes</b>				
4							
5							
6							
7							
8							
9							
10	<b>11. Warning Signs</b>		<b>3. Left Pole</b>		<b>4. Right Pole</b>		<b>My Reflections</b>
11							
12							
13							
14							
15							
16							
17							
18							
			<b>2. Deeper Fear:</b>				

Figure D4. Polarity Map resource. Each individual had their own copy of this resource to work through the prompts. They could also view and comment on their colleagues' work.

Prototypes

File Edit View Insert Format Data Tools Add-ons Help All changes saved in Drive

Comments Share

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
1	<b>Technology for the Purpose of...</b>			<b>Deeper Learning:</b>															
2				Did the lesson or activity allow students to go beyond factual recall and procedural negotiation so that they could be creating, collaborating, critical thinking and problem solving? Did students need to be deeper learners and does so that they can add value beyond what search engines, Siri, and YouTube already can do. Use these questions to think as provocateurs that allow your students to engage in deeper learning.															
3	<b>New Name</b>	<b>Context</b> - provide the full name of the teacher, class, grade-level, or subject	<b>Deeper Thinking</b> - Will the learning activities and assessments allow students to engage in critical thinking and complex, messy (not simple) problem solving?	<b>Creativity</b> - Will students have the opportunity to design, create, make, or otherwise add value that is unique to them?	<b>Personalization</b> - Will students have the opportunity to reflect on their planning, thinking, work, and/or progress?	<b>Authenticity</b> - Will students clearly understand the learning, not just what they're doing?	<b>Communication</b> - How will the students communicate?	<b>Collaboration</b> - How will the students communicate?	<b>Communication</b> - Will digital technologies be used to facilitate communication?	<b>Collaboration</b> - How will the students be working?	<b>Collaboration</b> - How will the students be working?	<b>Collaboration</b> - How will the students be working?	<b>Collaboration</b> - How will the students be working?	<b>Collaboration</b> - How will the students be working?	<b>Collaboration</b> - How will the students be working?	<b>Collaboration</b> - How will the students be working?	<b>Collaboration</b> - How will the students be working?	<b>Collaboration</b> - How will the students be working?	<b>Collaboration</b> - How will the students be working?
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Figure D5. Technology for the Purpose Of... resource. Each individual had their own copy of this resource to work through the prompts. They could also view and comment on their colleagues' work. This resource contained protocols to address deeper learning, personalized learning, and authentic learning.



## Appendix E

### Data Analysis Summary

#### Outcome Evaluation

*RQ1: To what degree did using the digital resources affect the organizational learning capacity of the districts?*

**Indicator:** Organizational Learning Capacity (dependent variable)

- **Data Source(s):** pre/post responses on Likert-scale items from the Organizational Learning Survey (Goh & Richards, 1997; Goh, Quon, & Cousins, 2007)
- **Frequency:** pre and post tests
- **Data Analysis:** measures of central tendency to examine differences between the pre and post-test scores within each district followed by non-parametric Wilcoxon Signed Rank test to look for statistical significance

*RQ2: How did the language used by participants to describe innovative classroom practice to prepare students for the knowledge economy change as a result of using the resources?*

**Indicator:** Common Language (Dependent Variable)

- **Data Source(s):** open response descriptions of innovation from pre and post-tests, qualitative data gathered during the process evaluation (outputs from the digital resources, audio transcripts from check-in meetings, emails, and notes from phone calls)
- **Frequency:** pre and post-tests as well as throughout the process evaluation
- **Data Analysis:** in coding the data collected during the process evaluation, the researcher applied attribute and descriptive codes during the first cycle of analysis (Saldana, 2009) to identify evidence of language. These codes included *RQ2 language* to connect the data to the research question, indications of types of language such as *personalized* or *SAMR*, as well as *Future Ready* or *4Cs* to indicate alignment with existing initiatives.

*RQ3: How did engaging in the sociocultural activities with the resources affect communication between the participants within their districts?*

**Indicator:** Quantity of communication (mediating variable)

- **Data Source(s):** social network data collected via the School Staff Social Network Questionnaire (Pitts & Spillane, 2009)
- **Frequency:** pre and post-tests
- **Data Analysis:** imported social network data into Gephi (social network analysis application). Calculated the average degree statistic and betweenness centrality to examine shifts in quantity.

**Indicator:** Quality of communication (mediating variable)

- **Data Source(s):** Likert-scale questions from School Staff Social Network Questionnaire (Pitts & Spillane, 2009) to examine the relational aspects of communication
- **Frequency:** pre and post-tests
- **Data Analysis:** imported social network data into Gephi (social network analysis application). Used the Likert-scale data to determine the edge weights in the networks. This data influenced the generation of the sociograms to illustrate the quality of network connections.

**Indicator:** Existing organizational structures (moderating variable)

- **Data Source(s):** interviews with central office stakeholders to understand the existing structures that could impact communication (e.g. presence of coaches, teacher-leaders, etc.; schedule of regularly occurring collaboration/meeting times; roles and responsibilities of leaders within the districts)
- **Frequency:** once – occurred during needs assessment
- **Data Analysis:** notation of the presence of these structures

## Process Evaluation

*EQ1: With what frequency did participants use the different resources?*

**Indicator:** Frequency of use (indicator, dose)

- **Data Source(s):** Activity logs from the digital resources and number of clicks on tracking links; data collected in a spreadsheet
- **Frequency:** Monitored weekly
- **Data Analysis:** count of number of times the resources are accessed per person per week, count the number of clicks per week per district, calculate percentages of interactions per resource per district

**Indicator:** Initial Training (indicator, dose)

- **Data Source(s):** Attendance sheet and output from the *Essential Improvements* resource completed during the training
- **Frequency:** once

- **Data Analysis:** attendance indicated on a spreadsheet. Participation calculated as the percentage of individuals within each district who completed the *Essential Improvements* activity

*EQ2: How did participants use the resources to engage in conversations about innovation of classroom practice with members from different stakeholder groups in their district?*

**Indicator:** Active participation in training session (indicator, responsiveness)

- **Data Source(s):** output in the *Essential Improvements* resource during activity
- **Frequency:** once
- **Data Analysis:** thoroughness of information entered into the resource during the initial training session measured by completion of all three prompts and the reflection area

**Indicator:** Choice of digital resources (indicator, responsiveness)

- **Data Source(s):** Resource outputs and qualitative data captured during check-in meetings
- **Frequency:** weekly
- **Data Analysis:** qualitative analysis of outputs from the digital resources coded based on indications of context (e.g. how/why participants used the tools) and emergent themes. Digital comments and check-in meetings to confirm or triangulate as necessary.

**Indicator:** Use of the resources to engage in the sociocultural activities (indicator, responsiveness)

- **Data Source(s):** Resource outputs and conversations from check-in meetings
- **Frequency:** weekly
- **Data Analysis:** analysis of the digital resources coded based on the tenets of joint work, boundary-spanning, and brokering as specified in the literature. Qualitative analysis of conversations from the check-in meetings.

*EQ3: How did the participants within the different districts use the same set of digital resources?*

- *EQ3a. Given that each district received the same resources, did existing strategic or technology plans moderate participants' choice of resources or use of the tools?*

- *EQ3b. Did the existing organizational structures of the districts moderate the effects of the intervention program?*

**Indicator:** Existing strategic/technology plans (moderating variable)

- **Data Source(s):** Document analysis of published technology or strategic plans conducted during needs assessment.
- **Frequency:** once – occurred during needs assessment
- **Data Analysis:** code documents based on emergent themes (completed during needs assessment)

**Indicator:** Existing organizational structures (moderating variable)

- **Data Source(s):** interviews with central office leaders to understand the existing structures that could impact communication (e.g. presence of coaches, teacher-leaders, etc.; schedule of regularly occurring collaboration/meeting times; roles and responsibilities of leaders within the districts)
- **Frequency:** once – occurred during needs assessment
- **Data Analysis:** notation of the presence of these structures

**Indicator:** Choice of digital resources (indicator, responsiveness)

- **Data Source(s):** Resource outputs and qualitative data captured during check-in meetings
- **Frequency:** weekly
- **Data Analysis:** qualitative analysis of outputs from the digital resources coded based on indications of context (e.g. how/why participants used the tools) and emergent themes. Digital comments and check-in meetings to confirm or triangulate as necessary.

**Indicator:** Use of the resources to engage in the sociocultural activities (indicator, responsiveness)

- **Data Source(s):** Resource outputs and conversations from check-in meetings
- **Frequency:** weekly
- **Data Analysis:** analysis of the digital resources coded based on the tenets of joint work, boundary-spanning, and brokering as specified in the literature. Qualitative analysis of conversations from the check-in meetings.

*EQ4: To what extent did the implementation of the program adhere to the intended design?*

**Indicator:** Initial Training Session (indicator, adherence)

- **Data Source(s):** Researcher journal, attendance sheet
- **Frequency:** once
- **Data Analysis:** determine that all districts received initial training sessions. Note any modifications made to the design or implementation of that session.

**Indicator:** Implementation of Resources (indicator, adherence)

- **Data Source(s):** Resources from each district
- **Frequency:** once
- **Data Analysis:** Researcher journal to track changes made to the individual resources by request of the districts

**Indicator:** Virtual Check-ins (indicator, adherence)

- **Data Source(s):** digital resources
- **Frequency:** weekly
- **Data Analysis:** Researcher journal to track comments made within resources by the researcher, electronic communication sent to participants from the resources, and data entered into spreadsheet to track frequency of analysis

**Indicator:** Face-to-Face Sessions (indicator, adherence)

- **Data Source(s):** Attendance sheet and researcher journal
- **Frequency:** four (4) times per group in each district
- **Data Analysis:** spreadsheet to indicate attendance in sessions and notes entered into research journal to note changes in the frequency, duration, or format of the sessions

*Note:* The researcher will be responsible for all data collection.

## Appendix F

### Qualitative Code Book for the Intervention Study

Following the qualitative coding guidelines from Saldana (2009), three round of coding occurred until saturation. While importing the data into NVivo for analysis, the researcher coded elements by attribute and also based on indicators of fidelity, the individual research questions, the names of the specific digital resources, as well as key terms from the literature associated with the following constructs: TPACK (Mishra & Koehler, 2006), Power (Bolman & Deal, 2008), and the sociocultural activities (Honig, 2008;2012; Honig & Rainey, 2014; Swinnerton, 2007). During the second round, the researcher applied these provisional codes to the data and also documented new codes as they emerged.

### Preliminary Codes

**Attribute Codes** – codes to describe the object of analysis

- **Journal Reflection:** indicated a reflective note from the researcher
- **Face-to-Face:** data collected during a face-to-face encounter (e.g. training or check-in meeting)
- **Check-in Email:** describes the emails sent to participants on a weekly basis from the researcher
- **Email Chain:** categorizes a series of emails between a participant and the researcher
- **Phone Call:** notes and reflections captured during a phone conversation
- **Digital Resources:** data collected as an output from the digital resources

### Codes by Research Question

- RQ1 - Impact of sociocultural activities on communication
- RQ2 - How language changed as a result of using tools
- RQ3 - Did resources impact organizational learning
- EQ1 - Frequency of tool use
- EQ2 - How Participants use tools to have convos
- EQ3 - How different districts used resources
- EQ4 - Adherence to design

### Codes for Analysis of Fidelity

- Adherence
- Frequency/Dose
- Responsiveness
  - **Protocol** as emergent code for when individuals started discussing using the tools as a protocol but not as the digital platform.
  - **Model** as emergent code to indicate when I was modeling with the tools or when the participants noted the need for modeling.

### Codes by Digital Resource

- Essential Improvements
- Think-Feel-Care
- Empathy Map
- Polarity Map
- Tech for Purpose
- **Greater Purpose** as emergent code for when discussions focused on identifying just the *greater purpose* as an entry point to any of the resources.
- **Individual Tabs** as emergent code because the tabs themselves created issues and challenges. The focus was on the technology of the digital resource and not what it represented.

### Codes by Sociocultural Activity

- **Joint Work:** work that all parties find mutually beneficial (Honig, 2008;2012; Honig & Rainey, 2014)
  - Daly & Finnigan (2010) - joint work happens when people trust each other and engage in communication
- **Boundary-Spanning:** the act of translating policy into practice (Honig, 2008); carrying information between nodes in the system and engaging in bi-directional communication (Swinnerton, 2007)
- **Brokering:** coordinating work with others throughout the system (Swinnerton, 2007); formal leaders broker communication and intentions throughout the nodes in the network (Spillane & Kim, 2012); leaders *broker* responsibilities to ensure that subordinates can stay on task (Honig, 2012).
- **Protocol:** emergent code - indication that participants used the digital resources as a protocol to support the sociocultural activities

### Codes related to TPACK (Mishra & Koehler, 2006)

“TPACK forms the basis of good teaching with technology” (Mishra & Koehler, 2006, p. 1029). Requires deep understanding of content, pedagogy, and technological capacity afforded by digital tools.

- Pedagogy - More than just teaching to the test or presenting the content but understanding best strategies for learning.
- Technology - Skills of the tools themselves (mechanics and fluency)
- Understanding of how technology impacts teaching and understanding of content. Can use technology to support new pedagogical strategies.
- **Sign of Innovation** – a symbolic gesture to appear as though using technology or acting innovative but without the deep pedagogy
- **Tech Tool Focus** – discussion of specific tools and apps absent purpose or intent

### Descriptive Codes

Based on the observations from the first round of coding, the researcher expanded the codebook. First, the researcher created new descriptive codes based on the literature about power. Then, the researcher added emergent codes to then use as a priori codes until saturation.

**Power** – codes used to identify elements of the dynamics of power within the districts

- **Structural (Bolman & Deal, 2008):** demonstration of authority based on structure, rules/policies, standards, and performance controls
  - Blaming others can be viewed as a structural issue. Especially when blaming the bureaucracy
  - Focus on maintaining or achieving compliance
- **Political (Bolman & Deal, 2008):** conflict over scarcity of resources, coalitions, authorities vs partisans (authority based on social vs structural control), conflict, collective establishment of goals. Competing groups use power to get what they want. Focus on strategy more than conflict resolution.
  - Positional power (authority)
  - Control of rewards
  - Coercive power - ability to restrain, constrain, or punish
  - Information and expertise - those who know how to solve problems or control flow of information
  - Personal power - charisma, social standing, "referent power" that comes when others want to be like you (p. 204)
  - Alliances and networks
  - Access and control of agenda as a by-product of alliances (ability to get a "seat at the table")
  - Framing - control of meaning and symbols, usually by the elites within the org.



- **Symbolic (Bolman & Deal, 2008):** words that carry meaning, activity & meaning, figurative vs literal power, values, vision, stories
  - Creates an appearance of legitimacy to preserve the institution (e.g. grammar of school)
  - Presentation considered more important than results
  - Does a school look like a school? Does the public perceive that it does what it should? Is there an appearance of legitimacy?
  - Planning as a symbol for change (but without requiring or ensuring action)
  - Well-connected people perceived to have power
  - Symbolic leaders inspire but do not necessarily motivate to action
- **Time (Willower, 1991)** - emergent code, *time* serves as a proxy for political power.
- **Coherence (Elmore et al., 2014; Mourshed et al., 2010)** – emergent code, indications that either coherence of initiatives did not exist or comments about trying to achieve coherence. Coherence could imply controlling the agenda or be viewed as a means to mitigate power as it brings the system into alignment.
- **Wait Time** – emergent code, the researcher noted the amount of time for participants to respond to an oral question before a person with a position of authority either responded or redirected the conversation
- **Trust** - Invivo code, a person commented about lack of trust or trusting a particular individual or group
- **Control** – emergent code, not liking to not know, not liking the break in structure, loss of control and management in the classroom

**Organizational Learning Community** - all codes in this theme emerged during 2nd round of coding

- **Reflective** - describes participants engaging in reflection and metacognition
- **Communication-Transparency** - discussion of need for, or process of engaging in communication, collaboration, and transparency. The transparency component was either a request or an output of the communication.
- **Empathy** - discussion of engaging in empathy with others. Not necessarily associated with a specific resource but describing the process of empathy.
- **Community** - Signs of collegial community within the group.
- **Comfortable** - researcher noticed behaviors that indicate the group is comfortable with each other.
- **Use in groups** - explicit comments that participants would rather use the tools within school or department groups.
- **Support system** - explicit conversation about creating support systems for innovation to break feelings of change in isolation
- **Silo** - when individuals admit that they feel as though they exist within a silo, initiatives exist within a silo, or there is the challenge of a silo
- **Leadership** – events or signs of demonstrations of leadership

## **Curriculum Vitae: Beth R. Holland**

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### **EDUCATION**

**Johns Hopkins University: Doctorate of Education (Ed.D) Degree, August 2018**

Course Specialization - Entrepreneurial Leadership in Education

Dissertation Focus -- Communication and Organizational Learning in Public School Districts

**Harvard University: Education Master's (Ed.M) Degree, June 2002**

Concentration – Technology, Innovation, and Education

**Northwestern University: Bachelor of Science (BS) Degree, June 1998**

Major – Communication Studies

Concentration — Creative Writing for the Media

### **PROFESSIONAL EXPERIENCE**

**Johns Hopkins School of Education, Baltimore, MD, June 1, 2015 – Present**

*Teaching Assistant*

**EdTechTeacher Inc., Dorchester, MA, July 1, 2011-Present**

*Professional Development Consultant and Communication Coordinator*

**St. Michael's Country Day School, Newport, RI: July 2005-September 2011**

*Director of Academic Technology*

**Anteon Corporation: August 2002-December 2004 (now General Dynamics)**

*Research and Design Analyst*

### **BOOK CHAPTERS AND POLICY PAPERS**

Holland, B. (2018, May 21). Research to practice: What a failed intervention taught me about needs assessments. *Johns Hopkins School of Education Institute for Education Policy*. Retrieved from <http://edpolicy.education.jhu.edu/research-to-practice-what-a-failed-intervention-taught-me-about-needs-assessments/>

Holland, B. (2017). *What technology in the classroom?*. In James, D. & Warwick, I. (Eds), *World Class: Tackling the ten biggest challenges facing schools today*. New York: Routledge.

Holland, B. (in press). Technology as a cultural catalyst. *Access Points (ATLIS)*. Volume 2.

## **RESEARCH CONFERENCE PRESENTATIONS**

Holland, B. (2018, January 19). *From teacher education to opportunity to learn - Creating the conditions for teacher innovation*. Paper presented at the International Conference on Mobile Technology in Teacher Education, Galway, Ireland.

Holland, B. (2018, January 19). *Ignite school innovation through the power of paradigms*. Short paper presented at the International Conference on Mobile Technology in Teacher Education, Galway, Ireland.

## **KEYNOTE PRESENTATIONS**

### **2018**

Holland, B. (2018, May 10). *Every Great Rebellion Begins with a Band of Rebels*. Keynote speaker at the inaugural Inspired Learning Convention, Mendon, MA.

### **2017**

Holland, B. (2017, November 15). *Looking to innovate? Take control your thoughts, feelings, and actions*. Ignite keynote at the EdTechTeacher Summit, Boston, MA.

Holland, B. (2017, August 18). *The science of improvement: How to systematically innovate classroom practice*. Keynote speaker at the annual Technology-Enabled Learning and Leading Institute, Toronto, Ontario.

Holland, B. (2017, April 28). *Preparing students to surf the “Third Wave”*. Keynote speaker at the iEngage Berwyn conference, Chicago, IL.

Holland, B. (2017, April 4). *Using Improvement Science to build a roadmap for innovation*. Keynote speaker at the Iowa 1:1 Leadership Institute, Des Moines, IA.

### **2016**

Holland, B. (2016, March 15). *Are iPads in the driver’s Seat? What really drives student learning?*. Keynote speaker at the South African iPad Summit, Johannesburg, South Africa.

McCusker, S. & Holland, B. (2016, February 3). *Behind the science of innovation*. Keynote speaker at the EdTechTeacher Innovation Summit. San Diego, CA.

### **2015**

Holland, B. (2015, May 20). *Building community with the cloud*. Keynote speaker at the New England CanvaCon, Foster-Glocester, RI.

Holland, B. (2015, February 17). *Empowering students to tell the story of their learning*. Keynote speaker at the South African iPad Summit, Johannesburg, South Africa.

Holland, B. (2015, October 26 & 27). *Changing the paradigm in education: Teaching and learning in a 1:1 environment*. Keynote speaker for both days of Itts “A.Volta”, Perugia, Italy.

## **2014**

Holland, B. (2014, November 20). *The future of learning*. Keynote speaker at the annual meeting of the Associazione Italiana Biblioteche Progetto Invitro, Terni, Italy.

## **HONORS**

### **Top 25 Female EdTech Influencers**

onalytica, 2017

### **Top 10 PBL News Stories**

Article identified by the Buck Institute for Education as one of the top 10 reads of the year, 2017

### **Top 20 Must-Follow K12 Ed-Tech Twitter Feeds**

The Tech Edvocate, 2017

### **Top 50 Individuals Influencing Edtech and E-Learning**

onalytica, 2016

### **Top 100 EdTech Influencers to follow on Twitter**

TuningForke media company, 2016

### **Digital Leaders to Follow**

EdTechReview India, 2015

### **Top 35 edtech Influencers**

Webki, 2014

### **Top 5 ed-tech Twitter accounts we follow**

eSchoolNews, 2013

## **ORGANIZATIONAL MEMBERSHIPS**

**AERA** - American Educational Research Association. Member. 2018-present.

**ISTE** – International Society for Technology Education. Member. 2005-present.